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STAFF APPRAISAL REPORT

REPUBLIC OF KOREA

PORTS DEVELOPMENT AND ENVIRONMENT IMPROVEMENT PROJECT

AUGUST 12, 1994

Infrastructure Operations Division
Country Department I
East Asia and Pacific Region

CURRENCY EQUIVALENTS

(as of March 10, 1994)

Currency Unit	=	Won
US$1.00	=	Won 800

ABBREVIATIONS AND ACRONYMS

ADT	=	Average Daily Traffic
COD	=	Chemical Oxygen Demand
DMPA	=	District Maritime and Port Administration
DWT	=	Dead Weight Tons
CPR	=	Continuous Plankton Recorder
CY	=	Container Yard
EIA	=	Environmental Impact Assessment
EIRR	=	Economic Internal Rate of Return
EMB	=	Environmental Management Bureau
EA	=	Environmental Administration Assessment
GEF	=	Global Environmental Facility
ICD	=	Inland Container Depot
KCTA	=	Korea Container Terminal Authority
KMPA	=	Korea Maritime and Port Administration
KMI	=	Korea Maritime Institute
KORDI	=	Korea Ocean Research and Development Institute
LPCD	=	Liter per capita per day
LME	=	Large Marine Ecosystem
MARPOL	=	International Convention for the Prevention of Pollution from Ships
MOE	=	Ministry of Environment
MOST	=	Ministry of Science and Technology
MOT	=	Ministry of Transportation
MOHSA	=	Ministry of Health and Social Affairs
MOHA	=	Ministry of Home Affairs
MT	=	Metric Ton
NFRDA	=	National Fisheries Research and Development Agency
NOAA	=	National Oceanic and Atmospheric Administration
ODCY	=	Off-Dock Container Yard
PCTOC	=	Pusan Container Terminal Operating Company
PCG	=	Pusan City Government
PCR	=	Project Completion Report
PECT	=	Pusan East Container Terminal
PPAR	=	Project Performance Audit Report
RT	=	Revenue Ton
SOA	=	State Oceanographic Administration
SOE	=	Statement of Expenditure
SWDF	=	Ship Waste Disposal Facilities
TOC	=	Terminal Operating Companies
TEU	=	Twenty-Foot Equivalent Unit
UOR	=	Undulating Oceanographic Recorders
UNCED	=	United Nations Conference on Environment and Development
VTMS	=	Vessel Traffic Management System
YSLME	=	Yellow Sea Large Marine Ecosystem

FISCAL YEAR

January 1 to December 31

KOREA

PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Loan and Project Summary

Borrower:	Republic of Korea
Amount:	US$100 million equivalent
Terms:	15 years, including 5 years of grace, at the Bank's standard variable interest rate
Project Description:	The project would provide comprehensive support for addressing environmental issues in port and harbor development. The project would design and construct facilities for the collection, storage, treatment and disposal of waste from ships, and would install a vessel traffic management system to monitor, regulate and control the movements of vessels at the Ports of Pusan and Inchon/Asan. The project will also assist in financing the construction of the port and industrial complex at Dadaepo to allow for the relocation of many of the timber and fish processing plants from the current locations in the City of Pusan, and assist in the financing of container handling equipment for the Pusan Phase IV Container Terminal. The project will also finance a package of training and technical assistance which has been developed to strengthen the capability of KMPA to address environmental issues, and a program to monitor pollution, ecosystem productivity, biodiversity and changes in the yields of living marine resources in the Yellow Sea.
Benefits and Risks:	The project will improve the environmental conditions in the City of Pusan by reducing the air and noise pollution from the truck traffic related to the approximately 130 timber and 107 fish processing plants that will be relocated from the center of the City to Dadaepo. Additional benefits, from reduced truck traffic, will be realized when the 34 off-dock container yards are relocated to on-dock facilities and an inland container depot. The ship waste disposal facilities and the vessel traffic management system will improve the marine environment, and the environmental training program and the technical assistance to KMPA will strengthen the institutional capability to address marine environmental issues throughout the country. The main risks concern the implementation of policy decisions involving the removal of the timber and fish processing plants and the off-dock container yards and the rezoning of the vacated land, and the private sector financing of the port of Dadaepo. The anticipated impact of these risks is not expected to be great because its Government has clearly stated its intention to transfer industrial operations away from residential areas, and private sector groups have demonstrated their capacity to finance the construction of the port facilities.
Poverty Category:	Not applicable.

Estimated Costs:	Local	Foreign	Total
	(US$ million)		
Port of Dadaepo	330.3	94.7	425.0
Ship Waste Disposal	3.9	8.5	12.4
Vessel Traffic Management	8.0	13.1	21.1
Pusan Phase IV	323.4	145.3	468.7
Training and Technical Assistance	0.9	2.5	3.4
Base Cost	666.5	264.1	930.6
Physical Contingencies	66.6	26.2	92.8
Price Contingencies	59.9	23.7	83.6
Total Project Cost /a	793.0	314.0	1,107.0
Financing Plan:			
Bank Loan	-	100.0	100.0
KMPA	92.0	91.0	183.0
MOST	0.6	0.1	0.7
KCTA	363.6	122.9	486.5
Other /b	336.8	-	336.8
Total	793.0	314.0	1,107.0

Estimated Disbursements:

IBRD FY	1995	1996	1997	1998	1999	2000
	(US$ million)					
Annual	6.0	28.0	36.0	16.0	10.0	4.0
Cumulative	6.0	34.0	70.0	86.0	96.0	100.0

Rate of Return: 33.3%

Maps: IBRD Nos. 25591, 25592, and 25593

/a Includes taxes estimated at US$115.7 million equivalent.

/b The government will secure financing from the private sector or provide the funds from its own resources.

REPUBLIC OF KOREA

PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

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I. THE TRANSPORT SECTOR

A. The Transport Network

1.1 Korea has developed a multi-modal transport network capable, in the past, of supporting its sustained and phenomenal economic growth. The fast pace of economic growth has, however, placed heavy demands on all infrastructure facilities, including those in the transport sector, which are often operating close to or at capacity. In 1992, Korea's transport network comprised about 56,500 km of roads, some 1,550 km of expressways, about 6,500 km of railroad track, 48 international ports with 190 million tons (248 million revenue tons) of cargo handling capacity, and airports with capacity for 21 million passengers per year. In the same year, about 90% of all domestic passenger traffic, including urban traffic, moved by road. About 70% of domestic freight traffic moved by road, while over 30% moved by rail, and virtually all international containerized cargo went through the Port of Pusan. During the 1981-92 period, demand for transport services essentially doubled.

1.2 In the Sixth Plan (1987-91), transport sector investments were concentrated on roads (65%), followed by ports (20%), and rail (12%). In the Seventh Plan (1992-96), resources are allocated to roads (46%), rail and subways (35%), ports (12%) and air transport (7%). The allocations across sub-sectors did not change significantly with the New Economic Plan (1993-97). Included in this Plan are investments in new expressways, new passenger and truck terminals, a high speed train to operate between Seoul and Pusan, expanded subway systems in Seoul and Pusan and new subway lines in four other cities, a new international airport near Inchon, and new port facilities in Pusan, Kwangyang Bay (see Annex 1), Inchon and at several secondary ports.

B. Sector Issues and Government Objectives

1.3 Major sector policy issues to be addressed during the current Plan (1993-97) include: (a) creating a sector structure to raise transport efficiency further and cope with the increasing internationalization of the Korean economy;(b) expanding multi-modal and mass transport facilities to be responsive to increased demand, especially in and to large urban centers; and (c) strengthening transport administration and coordination.

1.4 The New Economic Plan aims to address the sector concerns by: (a) effecting changes in the patterns of growth in transport demand by promoting rail transport, giving priority to the development of mass transport networks to serve both urban and regional transportation needs and strengthening the multi-modal transport network for both passengers and freight movement to and from the ports; (b) relieving congestion along the Seoul-Pusan corridor by expanding transport facilities and rationalizing inter-regional demand, and developing Inland Container Depots (ICD) in the Seoul and Pusan areas for efficient container cargo handling; (c) improving financial resources for sector investments by increasing tax rates, introducing user charges, encouraging a greater private sector financing role, issuing bonds and seeking external resources; (d) improving land acquisition and compensation policies to avoid construction delays; and (e) introducing a regional strategic planning system under which 5-year regional plans would be developed by local authorities in collaboration with central government planners.

C. The Ports Subsector

1.5 **Traffic and Capacity.** Korea's export-oriented industrialization policy combined with its need to import raw materials has placed increasing demands on maritime transport. Port infrastructure and the vessel fleet have therefore been expanded rapidly, and Korea had, in 1992, 48 ports with the capacity to handle about 248 million revenue tons (rt) of cargo and docking capacity for about 366 ships along 111 km of berths. The capacity for petroleum and other liquid cargoes is about 145 million rt while the capacity for dry cargo is 248 million rt. Since 1980, cargo volume has increased at an annual rate of about 10%. Of the 455 million rt of freight that passed through Korean ports in 1992, containerized cargo amounted to 44 million rt or 2,876,468 TEU. However, aggregate design handling capacity was available only for 2,460,000 TEU.

1.6 The continuing expansion of Korea's foreign trade and coastal shipping will require major expansion of port facilities and increases in the vessel fleet. Seagoing traffic grew 15.2% per annum over the Sixth Plan (1987-91) and is projected to increase 5% during the current Plan (1993-97). The largest share of the seagoing traffic, about 30%, will use Pusan and Inchon, the two largest ports. Among the major commodities transported, petroleum will remain the most important, followed by coal, containerized and breakbulk cargoes. Growth of petroleum is about 2.7% per annum compared to 12.6% for containers and 10.6% for coal. These trends show the increasing containerization of general cargo.

1.7 As a result of this large increase in port traffic, Korea's ports, especially Pusan, suffer from serious port congestion. In 1992, 14,937 ships entered Pusan Port of which 648 or 4.3% experienced waiting time aggregating 44 hours each on average. Of the 3,815 container ships using Korean ports, 218 or 5.7% waited an average of 22 hours due to inadequate berthing and handling facilities. Ship waiting time was even higher and averaged 74 hours each for 1,201 ships entering Inchon port, almost half the total number. The Korea Maritime Institute (KMI) has estimated the direct losses caused by the above delays at about W50 billion (US$ 62.5 million) in 1992, but the direct and indirect economic losses, due to the increased cost of Korean cargo resulting from higher transportation outlays, would be nearly ten times that amount.

1.8 **Port Development Plans.** The foregoing shows that the expansion of Korea's foreign trade and coastal shipping will continue to require major increases in port facilities, vessel fleet and trained personnel. Port investment, as a percentage of GNP, averaged 0.21% during the thirty years ending in 1991 but showed a declining trend dropping to 0.17% in the Sixth Plan 1987-91. In comparison, port investment in Japan, as a percentage of GNP, was 0.31% in 1991 and in Taiwan 0.30% in 1990, which was much higher than in Korea in recent years. Port investment is expected to increase to 0.33% of GNP in the New Economic Five Year Plan (1993-97) with a view to achieving the following specific objectives:

(a) maintain an annual growth rate of 8.4% in freight handling capacity aimed at reaching an overall freight handling capacity of 356 million (rt) by 1996 and 512 million rt by 2001, will be actively pursued;

(b) plan port investment with a view to developing key ports to stimulate balanced regional development with an emphasis on Korea's west coast in preparation for expanding trade around the Yellow Sea rim and passenger traffic with China, and eventually, North Korea;

(c) increase private sector financing for constructing new ports, greater specialization of port functions and for optimizing the utilization of existing facilities;

(d) adopt an integrated approach linking port development with improving inland transport systems and urban development in the context of overall national priorities to link up key population centers; and

(e) give priority to addressing marine, coastal and urban environmental issues by collecting ship waste, expanding pollution control facilities at harbors and surrounding built-up areas, improving port operations and enforcing regulations.

Comparison of Port Investment by Planning Period[1]
(won billion)

Ports	Sixth Plan	Seventh Plan	New Econ Plan
Pusan	310	818 (368)	655 (434)
Inchon	95	726 (361)	94
Kwangyang Bay	108	343 (168)	374 (185)
Asan	37	368 (140)	538 (304)
Kunjung	54	341 (22)	211
Others	292	1,427 (124)	1,419
Total	896	4,023 (1,183)	3,291 (923)

1.9 In pursuit of the above mentioned port development objectives, the emphasis, during the New Five Year Economic Plan (1993-97), will be placed on several specific investment and policy initiatives. In order to meet the inadequate container handling capacity in Pusan, an unsatisfactory freight distribution system, increasing traffic congestion in Pusan, and consequently, the enhanced cost of manufactured exports, investments will be made to: (a) expand the container facilities at Pusan Port and Kwangyang Bay; (b) construct an ICD outside of Pusan and close the off-dock CYs to ease transportation

[1]Number in parenthesis are private investments - information not available for the Sixth Plan Period.

and pollution problems in Pusan and reduce distribution costs; (c) construct the port-cum industrial complex at Dadaepo to reduce truck traffic and noise and air pollution in the city by relocating many of the timber and fish processing plants; and (d) use private sector financing to develop facilities at Kwangyang Bay, Pusan and Inchon. Special attention will be given to appropriately locating adequate port facilities to expand Korea's trade contacts with China, Russia and North Korea. Investment plans will include the expansion of coastal shipping transport capacity to accommodate the use of large volume and specialized ships and facilities.

1.10 As shown in the earlier table, KMPA has estimated that about W3.3 trillion (US$4.1 billion) will be required for the planned port investments during the New Five Year Economic Plan period (1993-97) of which about W2.4 trillion (US$3.0 billion) will come from Government financing and about W0.9 trillion (US$1.1 billion) from private sector resources. Of this outlay, the major investments will be for the expansion of container facilities at Pusan and Kwangyang Bay, and the construction of the ICDs outside Seoul and Pusan.

1.11 **Organization and Staffing.** KMPA is a public sector administration, but its role and functions have been carefully designed to allow some operational flexibility within clearly defined powers under the overall supervisory umbrella of the MOT. While KMPA provides the port infrastructure to meet shipping needs and directly collects revenue from port users, it delegates in most instances, the functions of handling and storing the cargos on leased piers and in warehouses to private port terminal operating and stevedoring companies. Port handling equipment is usually privately owned. Such a distribution of functions ensures a high level of efficiency in cargo handling as it is essentially a private sector operation. It also facilitates the mobilization of resources for port infrastructure development from both public and private sector sources.

1.12 KMPA is headed by an Administrator who is appointed directly by the President of the Republic of Korea and has the rank equivalent to a Vice Minister. The Administrator is assisted by a Deputy Administrator who is designated by the Minister of Transportation upon the recommendation of the Administrator. KMPA is organized into eleven Bureaus and offices which administer all marine affairs through the ten District Maritime and Port Administrations (DMPAs). KMPA's staff totals about 2170, including 335 at headquarters and 1835 at various regional offices. Of the total staff, about 570 are in technical positions and 1600 in management and administration. There is a continuing need to strengthen functions, especially the capacity to undertake the more complex aspects of long-term port investment and planning in the context of rapidly and persistently rising demand, unavailability of adequate public sector resources to meet all necessary capacity improvements and the priority need to address environmental issues.

1.13 A recent organizational change resulted in the establishment of the Korea Container Terminal Authority (KCTA) in April 1990. KCTA was entrusted with the management, development and operation of all container handling facilities in Korea. KCTA has the power to make investments, mobilize funds by issuing bonds and incurring foreign and local debt, and to lease it's container facilities. Such facilities include those of the Pusan Container Terminal Operating Company (PCTOC), which is managing the first and second phase container handling terminals in Pusan and a new operating company, the Pusan East Container Terminal (PECT) to operate the third phase container terminal. KCTA is the single, largest shareholder (25%) in PECT, but the majority shares (75%) are owned by eleven private stevedoring companies. While KMPA must approve KCTA's annual plans and budget, the new company has autonomy in its day to day operations. KCTA receives the profits from PCTOC and PECT and re-

invests it in new container handling facilities such as the inland container depots at Yangsan, north of Pusan, Uiwang close to Seoul and the new Port of Kwangyang Bay.

1.14 **Operations and Maintenance.** The DMPAs are nominally responsible for cargo handling operations at the ports, but it is the numerous private Terminal Operating Companies (TOC) that do the actual cargo loading and unloading. The DMPAs, therefore, have a largely supervisory and coordinating role in operations. The use of the TOCs was recommended in an earlier Bank-financed study. At Pusan, there are several TOCs which operate at the grain, general cargo, bulk cargo and container piers. The two container terminals are operated at Pusan by separate TOCs, as described earlier. Since the maintenance of the terminals is the responsibility of the TOCs and most port equipment is privately owned, the port maintenance carried out by the DMPAs is limited to civil works and the dredging of access channels. This work is carried out satisfactorily.

1.15 **Accounting, Budgets and Auditing.** Port budgets are prepared at KMPA headquarters using information from individual ports. The annual budget is allocated directly to KMPA from the Economic Planning Board (EPB) as a line item rather than on an operational basis. As an enterprise established under the Government Invested Enterprise Act and related regulations, KMPA is subject to the supervisory control of the MOT and EPB. It also means that port operating revenue is regarded as part of the general government revenue and port operating costs plus funds for investment are provided from the government budget. However, effective January 1, 1994, all port generated revenues will be retained in the sub-sector for future port capital investments. All of KMPA's operating expenses will continue to be financed directly from the government budget (para 5.4).

1.16 KMPA uses standard government accounting but, under an earlier Bank-assisted project, an alternative commercial accounting system was developed to replace it. However, under the instructions of MOT, KMPA is implementing the commercial accounting system in parallel with standard government accounting.

1.17 KCTA uses generally accepted accounting principles applied in a commercial accounting system. Annual budgets are prepared on a line item basis rather than on an operational basis and submitted to KMPA for approval along with the annual business plan.

1.18 The National Board of Audit and Inspections, which reports directly to the President, inspects all of KMPA's accounts. In addition, the commercial accounts of KMPA and those of KCTA are audited by independent auditors in accordance with generally accepted auditing standards. Assurances were obtained during negotiations that the Government will cause KMPA and KCTA to have their financial statements and those of each of the DMPAs audited by independent auditors acceptable to the Bank. Such financial statements and audit reports would also include a separate opinion from the auditor on disbursements made using Statements of Expenditures (SOE) and on the IBRD Special Account for the Bank loan. Such statements and audit reports would be submitted to the Bank within eight (8) months of the end of each fiscal year.

D. Lessons Learned From Previous Operations

1.19 Altogether, five PPARs have been prepared for transport projects in Korea - one for the First and Second Port Projects, three for the six completed road projects, and one each for the Sixth and Seventh Railway Projects and the Coal and Cement Distribution Project. No particular issues were raised

in the implementation of the road projects. The need to develop detailed operating plans for project facilities was identified in the ports projects. Despite some cost and time overruns, physical works and procurement under the two railway projects were completed satisfactorily and the ex-post ERRs amounting to 22% and 15%, respectively, demonstrated that Bank financing was economically justified.

1.20 The Coal and Cement Distribution Project as completed did not resemble the original project design because the Government modified its coal utilization policy soon after the loan was approved. The project was recast at the inception of project implementation and was successfully completed despite some delay. The PPAR also concluded that the quality of the completed project work as well as maintenance in the three railway projects was good and that the sustainability of the benefits was certain. The main concerns in the railway and ports projects related to the institutional achievements.

1.21 In FY92-93, four project completion reports (PCRs) were prepared for Bank-financed transport projects, including the Seoul Urban Transport Project (2514-KO), the Kyonggi Regional Transport Project (2905-KO), the Seoul-Pusan Corridor Project (2600-KO) and the Third Pusan Port Project (2726-KO). While each PCR identified issues specific to the project concerned, there were also a number of common findings, as follows: (a) achieving institutional changes or financial restructuring has been difficult, particularly when such changes, for example tariff increases, are outside the immediate control of the project entity or there are strong social or political pressures against them; (b) since the level of transport investment required to assist the country to continue its present pace of economic development is beyond the Government's ability to finance, exploring new sources of financing for sector investments has, therefore, become critical, with the Government seeking innovative options to encourage private sector participation; (c) more attention needs to be paid to environmental issues, both physical and social, to avoid costly project delays and poor investment choices; (d) decisions concerning investments in transport tend to be based as much on social as they are on economic need, with visible initiatives, such as capital construction being more popular than management or other efficiency improvements; and (e) while domestic capacity to construct civil works is very strong, there is a marked weakness in the implementation of advanced technology and computerized systems.

1.22 The following observations are appropriate in regard to the above-mentioned PCR comments: (a) evidence of major uneconomic investments in the sector or purely politically motivated projects have not been identified by the Bank or any other source. In fact, one of the problems has been delays in undertaking some major, essential investments due to a protracted evaluation process of investment priorities in the context of scarce public resources given the large public investment demands of a dynamic economy; (b) although in the past pervasive central control has inhibited institutional change or tariff increases due to concerns about macroeconomic fundamentals such as inflation and growth, a less intrusive policy is now evolving with more enterprise autonomy and relaxed central controls; (c) this project and the construction of the container terminals at Kwangyang Bay are illustrative of a new Government strategy of seeking private sector resources to finance major transport investments and the innovative initiatives which are being taken to realize the strategy; (d) the Government has put in place an effective and acceptable Environmental Impact Assessment (EIA) procedure and an institutional framework to monitor all capital projects, including transport infrastructure, before they are approved for implementation; and (e) Korea's need for more advanced technology and system computerization is readily acknowledged in the dialogue with the Bank, and an effective system for promoting both domestic R&D and technology transfer has been established and is being implemented, inter alia, through Bank assistance in several technology advancement and related projects.

1.23 The PCR for the Third Pusan Port Project (2726-KO) raised issues concerning the environmental impact of port development and the sensitivity of the Government as well as the project entity (KMPA) towards addressing those issues. For example, during project preparation and initial implementation both physical and social environmental impacts were not addressed as seriously as warranted, and the resulting problems were encountered with ecological damage to bird nesting sites through dredging, land acquisition to complete a rail link to the port as well as compensation to a large number of affected people. In hindsight, similar comments are probably appropriate in many other Bank-assisted infrastructure investments generally, which were prepared at a time when environmental issues were not at the forefront of project sustainability concerns and the project authorities were not equipped to anticipate them. However, as noted earlier, a radical change towards greater environmental protection has taken place and, in the present project, attention to related environmental issues underlies the rationale for a Bank role, and has been given very high priority in project preparation by all concerned institutions. (paras 3.3, and 3.26 - 3.35).

II. THE ENVIRONMENT SECTOR

A. Legal and Institutional Framework

2.1 As a result of Korea's rapid urbanization and industrialization and the steadily rising living standards, environmental problems began to emerge in the 1970s. Air, soil and water pollution increased with the rapid growth in motor vehicle ownership, rising volumes of household and industrial waste and the growing use of agrochemicals. In responding to these demands, the Government took the first major step in creating an institutional and legal framework to address environmental concerns in 1977 with the establishment of the Environmental Management Bureau (EMB) under the Ministry of Health and Social Affairs (MOHSA). This was followed in 1978 by the Environmental Preservation Law, the first major environmental statute in Korea. This law introduced a number of important regulatory devices including the promulgation of environmental and emission standards, environmental monitoring, and environmental impact assessment (EIA) for new projects.

2.2 The increasing complexity of environmental issues and the growing public sensitivity to them in the 1980s led the Government to conclude that existing legislation needed to be broadened and its implementation strengthened. This resulted in 1990 in upgrading the EMB into the cabinet-level Ministry of Environment (MOE) and, in 1991, in the introduction of new legislation, the Basic Environmental Policy Law. These steps were supported by the passage of separate laws dealing with specific problems including air quality, water quality, noise control, hazardous substance control, solid waste management, marine pollution, and environmental dispute resolution. Enactment of this legislation has given the Government a stronger mandate to address a broad range of environmental issues. The legislation is also subject to periodic review and has already been revised with regard to solid waste, marine pollution and natural environment preservation.

2.3 Local authorities are responsible for implementation of the environmental laws at the local levels. In June 1992, most of the monitoring and enforcement responsibilities were decentralized from MOE to the 14 municipal and provincial governments. The latter are now responsible for guidance to and inspection of manufacturing firms, issuance of permits and registration of pollutant-discharging firms, levying and collection of discharge taxes and negligence fines, and closing down repeat offenders. MOE is the key agency responsible for formulation of policy and planning, approval of EIAs, establishment

of emission and ambient standards, monitoring and enforcement, and research and training. MOE retains central authority for the registration of toxic chemical manufacturers, and, through its regional offices, for periodically monitoring the environmental conditions including the compliance with the EIA.

B. Environmental Policy

2.4 The overall thrust of Korea's environmental policies is highlighted in the New Economic Five-Year Plan. The Plan calls for the strengthening of environmental standards to the level of the advanced industrialized countries and the strengthening of the "polluter pays principle" through raising the pollution excise tax and the introduction of advance deposits to ensure that the producers of toxic or nondegradable products (e.g. tires) finance the cost of disposal. The Plan sets objectives and, in a number of instances, proposes quantitative targets in key environmental areas. These areas are: (a) water quality - raise the quality of drinking water, expand sewerage treatment, improve industrial waste water management and strengthen river water management; marine preservation - expand pollution controlled dredging in port areas, improve waste water management in fishing areas, tighten pollution discharge controls and strengthen pollution control capabilities; (b) solid waste management - increase the number of regulated landfills, improve recycling of household waste, establish waste salvage stations to collect and sort waste materials suitable for reuse, and expand waste facilities; (c) air quality - increase the supply of clean fuels, reduce sulphur content in oils, raise auto emission standards and tighten enforcement of emission standards; and (d) environmental science and technology - preparation of a comprehensive plan for the development of environmental science and technology, promotion of R&D projects in pollution monitoring and control, and the development of low-pollution technologies.

2.5 The "polluter pays principle" is considered in Korea as essential to ecologically sustainable development. Such an approach will help the Government in its plans to introduce an environmental charge system in the country, which is to levy a tariff on activities which pollute air, land and water. The objective of the effluent charge system in Korea is not to send a price signal to the polluting source but to impose a penalty against non-compliance. However, since the charges are too low to deter pollution, polluters often find it cheaper to pay the penalties rather than take costly abatement measures. Although the present system does not provide any economic incentive to reduce emissions nor to induce the adoption of newly developed technology, the long term plan is to increase the charges in order to make the "polluter pays" system effective.

C. Marine Environment and Pollution Control

2.6 Data on marine pollution are relatively limited compared to other types of pollution data due to the complexity and the high cost of data collection. In 1987, MOE classified the national coastal areas into three classes according to their uses and established water quality standards. Class I is for fisheries where COD (Chemical Oxygen Demand) must be not more than 1 mg/l. COD for Class II (for swimming and recreation) must be not more than 2 mg/l while that of Class III (for industrial use and harbors) must be not more than 4 mg/l. Data collected from 10 monitoring stations around the country showed that the water quality in most coastal areas are of Classes II or III and high pollution was observed in some areas where waste treatment facilities are inadequate such as in Masan, Chinhae, Ulsan, Gwangyang, Gunsane, and Mokpo. Because most urban and industrial development is in the coastal zone, about 80% of the total marine pollutants originate from land-based sources, but rapidly expanding marine transport activities and marine accidents, oil spills, transport of hazardous substances, and discharges of solid waste and waste water including bilge oil compound the problem.

2.7 Due to deep water and fast tidal movement along the east coast, serious marine pollution in the East Sea is not expected. In the Yellow Sea and the South Sea, however, the shallow waters and slow tidal movements limit dilution and result in rapid degradation of the water quality. The pollution in the Yellow Sea is a major regional environmental issue and is a high priority in Korea's efforts to cooperate on global conservation. Korea's UNCED Report characterizes marine pollution of the Yellow Sea and trans-boundary air pollution as the two "imminent environmental problems". The Yellow Sea is one of the most important and sensitive marine ecosystems. It is experiencing extensive development along the west coast of Korea and the east coast of China, but more basic marine data are needed to facilitate its effective protection.

2.8 The Government has recognized the need to improve the protection and conservation of both coastal and international marine waters, through strict regulation of pollution discharge from coastal industrial and urban areas and upgraded sanitary sewage facilities, improved industrial waste management and participation in various international agreements. Several initiatives have already been taken including installation of sewage and waste water treatment facilities as well as used oil reception equipment on Korean vessels. Technology and equipment have been developed for monitoring and inspection of vessels and marine facilities and to cope with polluting accidents, such as oil spills, but they are not yet widely used. Marine conditions, including the quality of the sea water, are monitored by remote sensing technology.

2.9 Korea is a signatory to Annexes I and II (oily waters and chemically contaminated and noxious liquids) of the International Convention for the Prevention of Pollution of Marine Waters 73/78 (MARPOL) and has incorporated most of Annex V (garbage and solid wastes) obligations into the national legislation. Under this Convention, ships are permitted to discharge wastes at sea only under controlled conditions (e.g. water from oil tankers may not contain more than 15 mg/L of hydrocarbons), and ports are to provide facilities for the reception, treatment and disposal of ships' wastes.

2.10 In March 1991, Korea enacted National Law No 4365 for the Prevention of Marine Pollution. Article 46 of the law states that KMPA should prepare and maintain reception facilities for oil and other pollution material and to treat effluent from ships. Refineries have established such oil reception facilities at Pusan, Ulsan, Yeosu, Pohang and Inchon Ports where crude oil tankers berth. Currently, there are five private companies that receive ships' oily waste in major ports like Pusan and Ulsan, but ports in Korea do not routinely have the facilities to collect and dispose of the sewage, garbage and/or chemically contaminated wastes from ships. Further environmental concerns relate to the need for rapid response to shipping accidents and related spills, the disposal of dredging spoil and the need to take into consideration environmental criteria in port development plans and operating procedures. The project has components involved with the installation of ship waste disposal facilities, the implementation of a vessel traffic management system to reduce ship accidents, loss of life and oil spills, and training and technical assistance to strengthen the capacity of KMPA and KCTA to address environmental issues (see para 3.3).

III. THE PROJECT

A. Objectives

3.1 The primary objectives of the proposed project are to help address the major environmental concerns in Korean maritime transport, to reduce the level of noise, air pollution and traffic congestion in the City of Pusan, and to strengthen the Korea Maritime and Port Administration's (KMPA) capacity to deal with environmental issues during port development and operation.

B. Rationale for the Bank's Involvement

3.2 The project was specifically mentioned in the Country Assistance Strategy (CAS) presented to the Board on December 23, 1993. The Bank's involvement is a natural progression of its contribution to the development of Korea's port system and meets the goal of ensuring the incorporation of environmental considerations, technology transfer and institutional reform in the development of transport infrastructure. Through the project, the Bank would provide comprehensive support for environmental issues in port and harbor development as illustrated through the site selection process and economic evaluation of the Dadaepo Port, the focus on compliance with the MARPOL conversion, the approach to vessel traffic safety and the concern for the ecosystem of the Yellow Sea.

C. Project Description

3.3 The proposed project consists of the following components:

(a) Ship Waste Disposal Facilities

The proposed project will finance the construction of facilities for the collection, storage, treatment and disposal of liquid wastes, garbage and sewage from ships.

The required facilities will be provided at a number of ports strategically located throughout Korea in order to form a network of facilities that would be able to serve the entire maritime sector and collect and treat virtually all of the liquid wastes, garbage and sewage generated by the ships using Korean waters. Since the majority of waste material is produced by smaller coastal vessels, consideration will be given to developing a "hub" system at moderate sized ports around Korea. KMPA will provide the necessary facilities, to supplement those being implemented under the project, for the remainder of Korea's ports.

(b) Construction of the Port of Dadaepo

A nine-berth port complex with 1940m of linear wharves will be constructed at Dadaepo on the outskirts of the City of Pusan by KMPA for the handling of timber and marine products and other general cargo. The port will have an estimated annual cargo handling capacity of four million tons. The loan will assist KMPA in financing the construction of the breakwater, the dredging and the preparation of the channel. KMPA will finance the reclamation and construction costs for the wharves and the adjacent industrial complex from its own resources. However, KMPA is considering financing the port and industrial complex, under arrangements

satisfactory to the Bank, through a joint venture established by the various private companies that will relocate their existing industrial operations from the center of Pusan to Dadaepo.

Currently, the timber and marine cargoes are unloaded at the port facilities located in the center of the City and transported by truck through the City to the processing plants which are frequently located in residential areas. In an attempt to rationalize the land use pattern in the City, Pusan City Government (PCG) has decided to develop industrial areas, such as Dadaepo, on the outskirts of the City, and to relocate polluting industrial companies from their current locations in the residential parts of the City. The Dadaepo Port and industrial complex will be used to accommodate about 40% of the City's present timber processing plants and about 30% of the marine products processing plants. A new road is being constructed to connect the port-cum-industrial complex to the City's arterial highway network so that the existing streets in the area will not become congested by the increased truck traffic. By moving the handling of timber and marine products away from the main port facility, and by relocating many of the timber and marine product processing plants to the new industrial complex, the City's traffic congestion and air and noise pollution will be reduced, and the quality of living in the residential areas from which the plants will be relocated will improve significantly.

The PCG has had a policy of relocating the City's industrial facilities to designated locations for many years, but the lack of available land has delayed its implementation. The relocation of the timber and fish processing plants from their present locations to Dadaepo will be welcomed by the residents because it will improve the living conditions in the City and increase property values in the areas from which the plants relocate. The plant operators will also benefit from the reduction in the cost to transport raw materials, especially timber, to the existing plants located far from the port. This component will result in some resettlement of residents and the loss of income to local business (para 3.25).

(c) Vessel Traffic Management Systems (VTMS)

As a safety measure and to provide better control and co-ordination, the loan will finance the development and installation of a traffic management system to monitor, regulate and control the movements of vessels at the ports of Pusan and Inchon/Asan. When the system has been tested and found satisfactory, it will be replicated at other ports by KMPA. The system would reduce the number of ship accidents, increase safety of navigation, and improve the environmental conditions of Korean waters.

(d) Development of Container Terminal

KCTA is constructing four container berths 1400m long and 530m wide, originally designed as common user berths with a designed capacity of 1,200,000 TEUs, in Pusan (Phase IV Terminal) with local funds. Each of the berths will be a self contained operating unit with its own supporting container stacking area, container freight station, maintenance shop and terminal office. The berths will have a draft of 15m. and will be capable of accommodating vessels up to 50,000 dead weight ton (DWT). This will be the last phase of container berth development in Pusan. Upon completion, the berths will be leased to private terminal operators (para 3.4). Each of the four container berths being constructed will be equipped

with two quay side container cranes. The loan will help finance the procurement of these container cranes.

The limitation to port development in Pusan is dictated by environmental considerations and spatial constraints as well as in response to the pattern of primary traffic flows. Pusan's inland transportation network is already severely congested with serious air pollution caused by heavy port truck traffic. The city's mountainous terrain makes expansion of the road network impracticable and prohibitive in terms of cost. Since only 40% of the total cargo handled through Pusan is for its immediate hinterland, to ensure that the development is environmentally sustainable, the number of berths that will be developed in Pusan will be limited to four. Further development of additional container handling facilities will be undertaken by the private sector in Kwangyang Bay.

(e) Technical Assistance And Training

(i) Yellow Sea Large Marine Ecosystem

In order to fully address the multiple man-made disturbances now affecting the Yellow Sea Large Marine Ecosystem (LME), a comprehensive program for marine monitoring and assessment will be established. The program will monitor pollution, ecosystem productivity, biodiversity and changes in yields of living marine resources. Information collected will be used to construct quantitative indices to provide an overall assessment of the health of the LME, as well as a means to monitor changes in living marine resources and their environment. The loan will finance the program including the provision of monitoring equipment and training for the staff of the Korea Ocean Research and Development Institute (KORDI). (See Annex 1).

(ii) Ship Waste Disposal Facilities

Technical assistance will be provided to formulate and evaluate investment options, policies and strategies relating to the collection, storage, treatment and disposal of ship wastes. The study will recommend a method to recover the cost of the investments and the operations and maintenance of the facilities including the role of the private sector, and propose institutional and organizational options for the successful implementation of the facilities. The study will also develop detailed engineering designs for the main elements of the reception facilities at the recommended locations. (See Annex 2).

(iii) Environmental Training

The enhancement of the knowledge of KMPA staff on environmental aspects of port development, construction and operation will be provided through a comprehensive training program combining a local program with overseas visits. The training program will be developed and implemented in conjunction with the Ministry of Environment. (See Annex 3) Assurances were obtained at negotiations that KMPA will submit a proposal to the Bank identifying the participants and programs for the extended study

portion of the environmental training program no later than November 1 of the year preceding the training.

(iv) Operational and Technical Training

Fifty (50) man months of professional training will be financed by the project to further develop the engineering and operational staff of KMPA. The program will consist primarily of extended studies conducted at various overseas locations. The annual program will be developed in consultation with the Bank, and assurances were obtained during negotiations that KMPA will submit a proposal to the Bank identifying the participants and program for the operational and technical training program no later than November 1 of the year preceding the training.

(v) Institutional Development

Initiatives will be pursued with local financing and monitored by the Bank to: (a) develop a system to privatize the multi-purpose terminals at all 27 international ports; (b) develop an improved system of performance agreements between KMPA, KCTA and the various terminal operating companies; (c) develop the means within KMPA to better manage and coordinate the maritime environmental improvement program; and (d) prepare standard operating procedures and engineering designs to be used to retrofit existing port facilities to minimize the pollution caused by port operations.

Private Sector Participation

3.4 An integral part of the project is the involvement of private sector interests in the management and operation of ship waste disposal facilities and in the development, management and operation of the new Dadaepo port-cum-industrial complex and container terminal handling facilities in Pusan and Kwangyang Bay. Private sector participation in the waste disposal facilities may take the form of a management or operating lease, and, in the case of the Dadaepo complex, through direct financing and development of the whole of the complex with the exception of the breakwater (including the revetments) and the navigation channel. The berths under construction in Pusan Phase IV will be leased to terminal operators investing in the development of Kwangyang Bay Port as part of the package, developed in conjunction with the Bank during project preparation, to promote private sector participation in the port sub-sector. The latter development will be financed from the proceeds of the sale of bonds issued by KCTA and guaranteed by the Government for the construction of the facilities at Kwangyang Bay. The bond issue carries with it the right of the buyer to operate and manage one container berth each at Kwangyang Bay and Pusan Phase IV. The terms and conditions of the bond issue and of the leases for the management and operation of the berths have been finalized taking into account the advice and comments of the Bank. The Government has also decided that the multi-purpose/general cargo berths would also be progressively leased to the private sector. Detailed arrangements for the leases are in the process of being formulated by KMPA.

Improving Institutional Performance

3.5 To improve financial accountability, KMPA was recently made financially autonomous with the establishment of a Port Special Account in which all port related earnings would be retained and from

which all port capital spending would be met (para 5.4). Lease arrangements between KCTA, PCTOC, and PECT have also been restructured to promote higher berth throughput. To further improve the management and operational capability in the port sub-sector for handling containerized cargo, performance agreements, which will include key measures of performance, are being developed in conjunction with Bank staff.

D. Cost Estimates

3.6 The total project cost is estimated at W937.7 billion or US$1,106.9 million equivalent with a direct and indirect foreign exchange component of W266.0 billion or US$314.0 million equivalent, including taxes and duties estimated at US$115.7 million equivalent. The cost of civil works is based on quantities calculated from preliminary engineering designs, costed at current market prices and checked against prices of actual similar works. The cost of equipment is based on prices quoted by manufacturers and suppliers in recent bids for the procurement of similar equipment executed with Bank financing. The cost of consulting services is estimated on the basis of recent fees charged by foreign and local consultants for services similar in nature and scope. Detailed cost estimates are found in Tables 1 to 5 and are summarized below:

SUMMARY OF PROJECT COST ESTIMATES
(March 1994 Prices)

	Local	Foreign	Total	Local	Foreign	Total
	--- (Won billion) ---			--- (US$ million) ---		
Civil Works	524.84	140.96	665.80	656.07	176.18	832.25
Equipment	7.58	68.36	75.94	9.50	85.46	94.96
T.A./Training	0.73	2.00	2.73	0.90	2.48	3.38
Sub total	533.15	211.32	744.47	666.47	264.12	930.59
Physical Contingency/a	53.27	20.94	74.21	66.58	26.19	92.77
Price Contingency/b	85.27	33.80	119.07	59.89	23.71	83.60
Total project cost	671.69	266.06	937.75	792.94	314.02	1106.96

/a 10% of civil works and equipment.

/b Using an international price escalation factor of 2.5%, and a Korean price escalation factor of 5%.

E. Financing Plan

3.7 The Bank loan of US$100 million, representing about 9.0% of the total project cost or about 31.8% of the foreign exchange cost, will be made to the Government and will be used to finance the foreign exchange cost of the breakwater at Dadaepo, the procurement of equipment for the reception and treatment of ship wastes, the VTMS, and container quay cranes for Pusan Phase IV and the provision of technical assistance and training. Retroactive financing amounting to US$0.2 million would be

provided to meet the cost of consulting services for the feasibility and detailed engineering of the ship waste disposal facilities. The Government is considering financing from the private sector to develop the port and industrial complex at Dadaepo, at an estimated amount of US$336.8 million, or provide the funds from its own resources. The remaining foreign and local costs will be financed by KMPA, MOST and KCTA for the components belonging to each respective agency.

3.8 Financing for the project will be provided as follows:

Component	Total Cost	Bank Loan	KMPA/ MOST	KCTA	Other /a
	----- (US$ million) -----				
Civil Works	990.28	52.0	172.72	428.76	336.80
Equipment	113.00	45.5	9.80	57.70	
Technical Assistance and Training	3.68	2.5	1.18		
Total	1,106.96	100.0	183.70	486.46	336.80

/a The Government will secure financing from the private sector or provide the funds from its own resources.

F. Status of Preparation

Ship Waste Disposal Facilities

3.9 KMPA has contracted with the Korean Maritime Training and Research Institute to prepare the feasibility study for the reception and treatment of oily water and chemical/noxious wastes at the 27 international ports of Korea. Preliminary investigations were completed in June 1992. A feasibility study for all 27 ports is scheduled to be completed by December 1994 and followed by the preparation of detailed design work for the selected ports to be completed by July 1995. Terms of reference for the study are found in Annex 2.

Vessel Traffic Management System

3.10 The preliminary feasibility study for the VTMS was completed in October 1993. Detailed design work commenced in April 1994, and to be completed by January 1995.

Yellow Sea Large Marine Ecosystem

3.11 The detailed work program has been prepared jointly with officials from the respective Korean and Chinese (the State Oceanic Administration of China) agencies, and procurement of the monitoring equipment and preparation of the TORs for the training program can be started in the middle of 1994.

Construction of the Port of Dadaepo

3.12 The feasibility study including the EIA was completed in November 1993. Detailed engineering for the development which commenced in December 1993 is expected to be completed by December 1994. Preparation of bidding documents for the construction of the breakwater is scheduled to start in January 1995.

Development of Pusan Phase IV Container Terminal

3.13 Four container berths are under construction. Reclamation of land for the back-up area is also underway. The whole development (berths, stacking yards, CFS, etc) is expected to be completed by the end of 1997. The bid documents for the procurement of the container handling equipment are under preparation by KCTA and are expected to be completed by December 1994.

Technical Assistance and Training

3.14 Terms of reference for the study and preparation of the detailed designs for reception and treatment of ship waste have been prepared and agreed to (See Annex 2). An environmental training program and the terms of reference to prepare the program have also been agreed upon (See Annex 3). The program for the monitoring and assessment of the Yellow Sea Large Marine Ecosystem is in the process of being finalized.

G. Implementation

3.15 Project components relating to the improvement of the environment and the relocation of timber and marine products processing plants to Dadaepo by the private sector will be the responsibility of Port Development Division in KMPA (para 3.3 (a), (b), (c), and (e) (ii - v)). KCTA will be responsible for the development of Pusan Phase IV and the procurement of container handling equipment (para 3.3 (d)). MOST will be responsible for the study of the Yellow Sea LME (para 3.3 (e) (i)), but the work will be contracted, on a sole source basis, to the Korean Ocean Research & Development Institute (KORDI) in view of the specialized nature of the work. KORDI will be assisted by consultants in selected aspects of the program. Consultants will be engaged to assist in the feasibility study and detailed engineering for the ship waste disposal facilities. Overseas training for the staff will be undertaken in agreement with the Bank.

3.16 The project is expected to be completed by the end of 1999 with a loan closing date of December 31, 2000. The implementation plan and schedule developed by the implementing agencies is shown in Table 6.

H. Procurement

3.17 Procurement arrangements for the project take into account the experience gained from previous Bank Group-financed port projects. The Bank's standard bidding documents will be used for procurement financed by the Bank under the project.

3.18 Procurement under the project will be carried out as shown in the following table. The figures in parentheses represent the amounts to be financed by the Bank. All figures include estimated physical and price contingencies and are rounded.

Procurement Methods and Disbursements
(US$ million)

	Procurement Method /a				
	ICB	LCB	Other/b	NBF	Total Project Cost
Civil Works	158.27	-	-	832.01	990.28
	(52.00)			-	(52.00)
Equipment	72.00	3.00	3.00	35.00	113.00
	(39.50)	(3.00)	(3.00)		(45.50)
Technical assistance and training	-	-	3.68 (2.50)	-	3.68 (2.50)
Total	230.27 (91.50)	3.00 (3.00)	6.68 (5.50)	867.01 (0.00)	1,106.96 (100.00)

/a Figures in parentheses are the respective amounts financed by the Bank loan.
/b International and local shopping. Includes consultant services.

NBF = Not Bank-Financed

3.19 Civil works in respect of the breakwater at Dadaepo estimated to cost US$158.27 million and major items of equipment and goods (for container handling, vessel traffic management, and the ship waste disposal facilities) with an estimated aggregate cost of US$72.00 million will be procured following international competitive bidding (ICB) procedures. However, a few items of standardized equipment estimated to cost not more than US$300,000 per contract and in an aggregate amount not exceeding US$3.0 million, where foreign bidders are not expected to be interested, may be procured by local competitive bidding (LCB) acceptable to the Bank. Further, items or groups of items covering minor pieces of equipment for environmental protection purposes estimated to cost less than US$200,000 per contract and in an aggregate amount not exceeding US$3.0 million may be procured following international and local shopping procedures on the basis of a comparison of price quotationssolicited from at least three eligible suppliers in accordance with the Bank's guidelines for procurement. Planned procurement packaging is shown in Table 7. Civil works and equipment not financed by the Bank estimated at US$832.01 million and US$35 million respectively are being procured following local procedures.

3.20 Prequalification of contractors for civil works in respect of the breakwater for the Dadaepo Port complex, and of suppliers for the ship waste disposal facilities and the VTMS will be undertaken in advance of bidding to ensure that invitations to bid are extended only to qualified bidders. All contracts exceeding US$300,000 for the procurement of works and goods, US$100,000 for firms and US$50,000 for individual consulting services, financed from the proceeds of the loan will be subject to prior review by the Bank. This would represent about 95% of the estimated amount of contracts financed by the Bank or 21% of all contracts under the project. Under ICB, qualifying domestic manufacturers will be eligible for a margin of preference in the comparison of bids of 15% (or the prevailing rate of customs duties, whichever is lower) for goods. All consultants financed from the proceeds of the loan will be selected and employed under terms and conditions acceptable to the Bank in accordance with the Bank's guidelines for the use of consultants except for the Yellow Sea LME program which will be executed by KORDI (para 3.15) which will also undertake the procurement of instruments and equipment and the engagement of consultants required for the program on a reimbursable basis.

I. Disbursements

3.21 Disbursements from the loan will cover:

(a) 35% of total expenditure in respect of civil works for the breakwater at Dadaepo;

(b) 100% of foreign expenditures for directly imported equipment, 100% of local expenditures (ex-factory) for locally manufactured equipment, and 75% of local expenditures for other items procured locally; and

(c) 100% of expenditures for consulting services and training.

3.22 To facilitate disbursement against eligible expenditures, a Special Account will be opened for KMPA with an authorized allocation of US$4.0 million which is the average expenditure for a four-month period, in a commercial bank acceptable to the Bank. Application for replenishment of the Special Account will be submitted regularly, preferably monthly, or when the amount is drawn down by 30%, whichever occurs first. A schedule of estimated disbursements, which takes into consideration the disbursement profile for transport projects in Korea, is given in Table 8. Assurances were obtained at negotiations that no disbursements will be made with respect to the Dadaepo component until KMPA provides the Bank with satisfactory evidence that the EIA has been approved by MOE for Dadaepo.

3.23 Disbursements will be made against full documentation except for small contracts for civil works and equipment worth less than US$300,000 each and for costs incurred for training and for contracts not exceeding $100,000 for consulting firms and not exceeding $50,000 for individual consultants which may be made on the basis of Statements of Expenditure (SOE). Documentation supporting SOEs will be retained by the implementing agency (KMPA) and will be made available for review by Bank supervision missions and audited annually by independent auditors (para 1.18).

J. Reporting, Monitoring and Supervision

3.24 In addition to field supervision missions, of which at least two a year will be undertaken during the initial period of project implementation, the progress of execution of the project will be monitored through biannual progress reports submitted to the Bank by KMPA, KCTA and MOST in respect of project components for which each of the agencies is responsible. An outline of the report is presented in Annex 4. The focus of Bank supervision efforts in the first year would be on the procurement of works and equipment and the measures to be taken to reduce pollution in port waters. Annex 5 summarizes the supervision mission plan for the project, and the project monitoring indicators are presented in Annex 6. During project implementation, the Bank's supervision staff would also monitor efforts to promote the participation of the private sector in the port system, to establish an environmental unit in KMPA, institutional development and financial and operating performances of KMPA and KCTA. Upon completion of the project, the Government, KMPA, KCTA and MOST will prepare implementation completion report not later than six months after the loan closing date.

K. Resettlement

3.25 Under the project, very few house and land owners are affected. The only project component with any anticipated resettlement concerns the construction of the port-cum-industrial facility at Dadaepo. The resettlement and rehabilitation of the affected people will be done in accordance with the Bank's policies [OD 4.30]. The amount of involuntary resettlement, therefore, has been minimized through the design of the complex and the location of the roads. In addition, the compensation to be provided to the affected people should be sufficient to replace all lost assets and income opportunities so that the affected people will be able to improve, or, at a minimum, restore their former living standards and income earning capacity. Resettlement compensation at Dadaepo is required, in an amount estimated to be W15 billion, for three houses which serve as both dwellings and small beach side restaurants, eight other vacant lots totaling about 90,000 sq.m., and three mariculture farms raising seafood and covering an area of 650ha. Compensation for the lost income for the businesses referred to above and for an additional twenty-five shops/buildings located in the area is estimated at about W13 billion. In accordance with Korean legislation, (see Annex 7) compensation for property was determined by independent professional valuations, and represents a 40% premium over comparative October 1993 market prices. Compensation for the loss of income from the businesses was computed to cover earnings over an eight year period for those businesses directly affected by the project. For those businesses that are indirectly affected, the compensation will be 30% of the earnings over a 2.5 year period. When resettlement actually takes place, compensation would be adjusted to reflect any increase or valuation of the assets. Assurances were obtained at negotiations that the affected people shall be consulted and participate in the design and implementation of the resettlement activities, and that at least 30 days prior to their displacement, each affected person shall be provided with a compensation package, in cash or in kind, sufficient to ensure that each person shall improve or at least regain, the standard of living and means of livelihood they were enjoying prior to their displacement. In addition, each compensation package shall include (a) compensation for the assets lost, or at least, at replacement costs; and (b) adequate subsistence allowance during the transition period of resettlement.

L. Environmental Impact

3.26 In Korea, the Basic Environmental Policy Law (BEPL) requires that an environmental impact assessment (EIA) be prepared prior to the construction of such structures as port facilities and industrial complexes. The EIA guidelines, issued by the Ministry of Environment (MOE), require, among other things, public consultation prior to approval of such projects by MOE. Public announcements are made through newspapers and public notices, and the EIA report is exhibited for public review and comment for 20 days. Results of the consultation are considered during the preparation of the final report and the comments and opinions of individuals and concerned agencies are documented in the report. The EIA process and guidelines used in Korea have been reviewed and found to be satisfactory.

3.27 The EIA studies of the Dadaepo and Pusan Phase IV components were carried out and the English summary of the reports were submitted to the Bank. The reports and other related information were reviewed during appraisal and found to be satisfactory. The results are presented in Annex 8 along with a more complete discussion of the process and results. The EIA approval for the Pusan Phase IV component was obtained in December 1992.

3.28 Implementation of these components would have significant positive impacts on both the economy and the environment. The Dadaepo component was developed and the site selected because of its location far from the city center and near existing large industrial areas. The relocation of many of the timber and fish processing factories to this port/industrial complex from their existing facilities scattered throughout the city would reduce the level of truck traffic and the risk of traffic accidents due to transportation of timber and fish products from the port. It would also reduce the levels of air and noise pollution and other nuisances in the areas from which the plants relocate. The expansion of the existing container handling facilities with the Pusan Phase IV component will provide more on-dock space which will facilitate the closing of many of the off-dock container yards located in the City and the related truck traffic.

3.29 Dadaepo has been designated as an industrial area for many years. In 1992, soon after KMPA had proposed to develop a new port/industrial complex at Dadaepo, a site analysis was started which focused on three possible sites for the port. The initial studies determined that the least cost solution would be to construct the port and the industrial complex on reclaimed land in the Nakdong River. The second best site, Dadaepo Bay, was far more expensive due to the depth of the water and the more limited amount of space available for the industrial complex. MOE overruled the first proposal since the Nakdong River area is protected by law as a natural preservation area. After lengthy discussions, it was agreed that the complex would be constructed in the Bay and up to the boundary of the natural preservation area under three conditions: no encroachment of the natural preservation boundary, no port activity along the Nakdong River side, and no waste water runoff into the Nakdong River. The basic design for the component was made based on this agreement. No separate site analysis was conducted for the Pusan Phase IV component since the site is in an industrial/port area and it was identified several years ago as the location for the next container terminal.

3.30 The assessment of the major negative impacts and the proposed mitigation measures for these two components were reviewed and found to be satisfactory. The impacts during construction and reclamation for both components are basically similar and the proposed mitigation measures are acceptable. The proposed procedures to minimize the generation and impact of air, noise and water

pollution are commonly used in Korea (control truck speed and work hours, prohibit the use of horns, plant trees, install sound proof walls, use pump dredges, install silt protector, etc.). The impacts at the existing quarry sites for rock and soil would be controlled under separate EIAs for each specific site. The impact due to sea sand excavation would be small since the area is located far away from the natural preservation area. The levels of Cd, Cu, Pb, Zn in the bottom sediments taken from Pusan and Dadaepo Bays are slightly higher than the "reference values" specified in the Netherlands standards and careful consideration regarding selection of the disposal site should be required. Since most of the dredged spoil from the Pusan Phase IV has been used for reclamation, contamination in other disposal sites is not expected. For Dadaepo Bay, the level of contamination would be carefully studied and measures taken to minimize the sediment disturbance during dredging. Disposal sites and the disposal methods would be done in accordance with MOE requirements.

3.31 During operation, the impacts and mitigation measures due to operation of the port facilities for both components are again basically similar. All waste would be managed according to the waste management plan of the City of Pusan and contractors would be assigned. Waste water would be collected and treated before being discharged. At Dadaepo, a separate waste water treatment facility would be constructed and the discharge would be monitored regularly. Marine water quality and air and noise pollution would be monitored according to the plan agreed upon by MOE.

3.32 Possible impacts on the Nakdong River and the mitigation measures are considered acceptable. Discharge of all kind of waste into the river would be prohibited. A 30m greenbelt would be constructed along the west boundary. To minimize the generation of air, noise, and odor and their impacts on the residents, effective pollution control facilities would be installed as required by MOE and PCG. A 30m buffer zone would also be created near the residential area. Assurance were obtained at negotiations that KMPA would be required to submit to the Bank the monitoring results/reports which are required by MOE for the Dadaepo component by March 31 of each year starting in 1996.

3.33 The consultation and compensation process was reviewed and found to be satisfactory. The consultation for Dadaepo was carried out twice: once during site selection and another during the preparation of the final EIA report. Attempts were made to minimize the need for resettlement, to create a forum for discussion, and to offer an opportunity for the residents to participate in the project. For the Pusan Phase IV component, KMPA/KCTA and the affected fishermen and women divers negotiated the compensation based on an assessment prepared by the Marine Research Institute and National Fisheries University of Pusan. A total of about W232 million ($290,000) was paid to 16 fishermen and 8 women divers in July-December 1992. No public complaints have been received during the construction of this component. KCTA submitted the post-environmental management and results of the monitoring to the MOE Pusan Regional Office by the end of March 1994. Assurances were obtained at negotiation that KCTA would be required to submit to the Bank the monitoring results/reports as required by MOE for the Phase IV Container Terminal by March 31 of each year starting in 1996.

3.34 The existing capacity of KMPA and KCTA to deal with the environmental issues related to the port construction and operation, including monitoring, needs to be strengthened as soon as possible. A training program has been developed and agreed upon as part of the technical assistance component of the project (Annex 3). In addition, technical assistance will be provided in the project to develop sample TORs for EIA studies, and standard operating procedures and engineering guidelines will be prepared to retrofit existing port facilities to minimize the pollution caused by port operations (para 3.3 (e)(v)).

IV. ECONOMIC VALUATION

A. Project Justification

4.1 The justification of this Project is based on: (i) supporting the Government's program to improve Pusan's urban environment and improve the quality of life of the city's population by: (a) relocating port activities (timber and fish processing) as well as storage of containers to more appropriate areas; (b) development of a more comprehensive approach to land use, whereby residential areas are rid of polluting and environmentally disruptive industries; (c) development of appropriately located industrial zones to bring together similar activities, thereby increasing overall efficiencies and reducing environmental damage; and (d) limiting expansion of the Port of Pusan and redirecting future growth elsewhere; (ii) improving Korea's coastal marine environment by constructing suitable facilities to collect and process the wastes produced by ships; and (iii) improving port safety through a pilot project to control and coordinate vessel movements.

B. Project Benefits

4.2 The most significant project benefits are those related to environmental improvements in the City of Pusan. Relocation of approximately 130 timber processing and 107 fish processing plants from the inner city's residential areas to the industrial sites at Dadaepo, will reduce truck traffic (and thus congestion, pollution and traffic accidents), and replace some of the polluting industrial activities with residential development.

4.3 The completion of Phase IV Container Terminal in Pusan, which will have a substantial on-dock container yard and the Yangsan Inland Container Depot (ICD), which started construction in June 1994, will benefit the environment by providing more space to store and process containers in and out of the Port and eliminate the need for virtually all of the existing 34 off-dock facilities which are presently scattered throughout the city and are significant contributors to Pusan's growing environmental problems (traffic congestion, pollution and safety). Finally, the implementation of the ship waste disposal facilities component will improve Korea's marine eco-system, not only in those ports and harbors where such facilities will be developed, but also in those cities and adjacent coastlines in which these ports are located, and which are affected by activities of both foreign and domestic vessels.

4.4 More generally, the environmental disruption to the well being of Pusan's population, caused by the continuous and rapid growth of the port, have led Korean officials to approve the development of a new container port, Kwangyang Bay (about 150 km south west of Pusan), and limit future expansion of the existing port at Pusan in order to improve the city's social and physical environment (See Annex 1). The project components are part of this master plan to clean-up the city of disruptive port and port-related industrial and processing activities, and relocate them to more appropriate areas outside of the city center.

4.5 In addition to the environmental improvements noted above, other benefits include improved operational efficiencies and cost savings due to increased economies of agglomeration brought about by the relocation of timber and fish processing plants now scattered throughout Pusan into a single industrial area; improved marine safety and decision-making capabilities brought about by the introduction of the

Vessel Traffic Management System (VTMS); and increased handling capacity resulting from the development of Phase IV Container Terminal in Pusan Port.

C. Present and Future Traffic

4.6 The rapid growth of traffic at Pusan Port has been slowed due, in part, to port congestion, and, in part, to a slowdown in the Korean economy between 1989 and 1991. However, the average annual increase was 7.8% between 1980 and 1985 and 8.2% between 1986 and 1992. In 1992 the port handled a total of 65 million tons, with general cargo accounting for 35% of total tonnage. Forty-seven percent of the traffic was outbound. Sixty-five percent of the traffic in Pusan Port is now containerized, with 3% accounting for trans-shipment (see Table 9: Historical Traffic Volumes).

4.7 Timber and Fish Traffic Presently about 20% of all timber shipments into Korea are handled through terminals in Pusan Port, and about 90% of the cargo is in the form of raw timber. The volume of raw timber has increased 3.7% annually between 1986 and 1992. The forecast anticipates that the growth rate will be about 4% between 1996 - 2001. Thereafter, virtually no growth is anticipated. (see Table 10: Past and Forecast Timber Traffic by Place of Origin 1986-2011). Due to a limited amount of space, most of the timber traffic is handled by lighterage, which increases port congestion and creates problems for the efficient handling of other cargo, including containers. Because of Pusan's importance as a timber port there is a thriving timber processing industry in the city. Presently there are over 300 timber processing plants located in various parts of the city, with about 150 of them in residential areas. Their location outside of the immediate port area (average distance is 13.2 km from the port), generates approximately 700 truck trips per day, much of it through the center of the city.

4.8 Currently, the Port of Pusan handles about 84% of Korea's fish traffic, with Masan handling 15% and Mokpo and Chungmu together handling the remainder. The growth of fish traffic in Pusan has increased at an average annual rate of 7% between 1980 and 1992 (see Table 11: Past and Forecast Fish Traffic). Much of the cargo remains uncontainerized, although this is gradually changing. In 1992, out of a total 678,000 tons handled, 56% was containerized. In Pusan, there are a total of about 350 fish processing plants, 130 in residential districts. Most are an average distance of 5.7 km from the port and generate approximately 130 truck trips per day.

4.9 Container Traffic Nationally, container traffic grew at an average annual rate of 5% between 1988 and 1992. In Pusan, this average was slightly higher registering a 6% annual growth (see Table 12: Container Traffic in Pusan Port). Pusan Port remains Korea's main container port, handling 95% of all containers in 1992, with Inchon a distant second at 4%, followed by Masan and Ulsan. In 1992 Pusan handled 2.6 million TEUs, with 67% handled at the port's container facilities and the remainder at the general cargo terminals. However, due to the lack of sufficient on-dock container facilities at the port site, off-dock facilities have been developed privately to service this need. They are located throughout the city, far removed from the port site. With the construction of the Phase IV Container Terminal and the ICD outside of Pusan, it is estimated that the demand for the off-dock container yards will decline sharply resulting in a reduction of approximately 1600 truck trips per day, generated by container traffic to these off-dock facilities.

4.10 Recent forecasts developed by KMI suggest a national growth rate for container traffic of 8% between 1996 and 2001, and 6.5% between 2002 and 2011 (see Table 13: Forecast Container Traffic). In Pusan, forecast growth for container traffic is 2.5% between 1996 and 2001, and 4% between

2002 and 2011, with port facilities (including Dadaepo and Phase IV) reaching capacity in 2000 of 81.6 million rt. Container traffic in Kwangyang Bay is forecast to grow at an annual rate of about 25% between 1996 and 2001 and 10% between 2002 and 2011. Given the expected volume of container traffic (total of 6.4 million TEUs in 2001 and 11.4 million TEUs in 2011) the importance of the Kwangyang Bay facilities becomes critical to continued container traffic growth. By the year 2011, it is projected that Kwangyang Bay will handle about 5.3 million TEUs annually (4.1 million TEUs of import/export traffic and the remainder trans-shipment and coastal traffic), and Pusan 5.0 million TEUs. With containerized cargo growing to 70% of all traffic in Pusan, shifts in use of port space are expected to occur. This will allow more container traffic to be handled than would otherwise have been possible. Although the forecast assumes growth in trans-shipment traffic (both container and general cargo), the proportion is not expected to surpass 20% of total traffic by 2011. With these assumptions the following growth rates have been developed, and are used in the economic evaluation:

Forecast Traffic Growth Rates in Pusan and Kwangyang Bay

	1997-2001	2002-2006	2007-2011
	----------%		----------
Pusan Port			
Containers	2.5	4.0	4.0
General Cargo	2.2	6.7	5.4
Timber	4.0	0.5	0.5
Fish	2.7	2.7	2.0
Kwangyang Bay			
Containers	27.0	11.0	10.0
GNP Growth	7.0	6.5	6.5

D. Economic Analysis

4.11 The costs and benefits have been evaluated in constant March 1994 prices. Financial cost estimates were converted to economic costs by excluding taxes, duties and price contingencies. Included in the cost estimates are: port construction costs; port operating and maintenance costs; compensation costs associated with resettlement; and environmental cost associated with decreased land value of the area adjacent to the new port and port related facilities at Dadaepo. With regard to the investments in the Pusan Phase IV Container Terminal, the economic analysis of the identified costs and benefits was prepared using traditional techniques for valuing and analyzing transportation projects. However, with respect to the investments in the Port of Dadaepo and the related industrial area, the traditional techniques used in transportation projects were supplemented with measures designed to quantify the environmental costs and benefits associated with the component. An explanation of the procedures employed in this environmental economic analysis are discussed in Annex 11, Methodologies for Determining Environmental Costs and Benefits of Port Projects. The composite EIRR for the project is estimated to

be 33.3%. (see Tables 14-16). More detailed discussions of the economic analyses (analyzed on the bases of "with" and "without" project scenarios) of the individual components is presented below.

4.12 Port of Dadaepo. In addition to the costs associated with the construction, maintenance and operation of the various project components (see paras 3.3), there are a number of environmental and resettlement costs directly related to the selection of the site for the Port of Dadaepo (Cove alternative). The site, located west of the existing Pusan Port complex, is presently used for fishing, small business activities and recreational purposes. Construction of the port facility will adversely impact these activities and significantly reduce the present pleasant appearance of the cove. Residential land values in the surrounding area, in particular, will be negatively impacted, with a resultant decrease in total economic residential land value estimated at W109 billion. In addition, construction of the Dadaepo Port and industrial facility will also impact about 28 households, affecting their income earning abilities. Those affected (mainly fishermen and their families) will, however, receive an estimated W28 billion as compensation (See Annex 10). These costs have been considered in the calculation of the EIRR presented below.

4.13 The benefits which have been quantified in the Dadaepo analysis include both traditional and environmental benefits. The traditional case includes: (a) savings in ship waiting time; (b) inland transport cost savings; and (c) savings in cargo handling. The environmental case includes: (a) reduction of air pollution in traffic corridors; (b) time savings for travel in traffic corridors; (c) savings resulting from reduced traffic accidents; (d) savings resulting from reduced road damage caused by truck traffic; (e) increased residential land values resulting from the relocation of polluting timber and fish processing plants; and (f) value of reclaimed land (see Annex 12). The EIRR for the Dadaepo component is 36.3% with a benefit/cost ratio of 1.94.

4.14 Pusan Phase IV. In the case of the Pusan Port Phase IV component only traditional benefits were quantified. These include: cargo handling cost savings and inland transport cost savings. The EIRR of the Phase IV component is 25.4% with a benefit/cost ratio of 2.41.

4.15 Ship Waste Disposal Facilities. As a consequence of Korea's signature of the MARPOL Convention and the passage of Law no.4365, every Korean port is required to provide, operate and maintain a certain level of service for ship waste collection, treatment and disposal. The environmental issue to be addressed nationwide is how to handle an estimated 46,000 annual tons (1992 estimate) of oily waste and sludge stemming largely from the operation of small to medium sized coastal and fishing vessels. In 1992 an estimated 20,000 tons were received for treatment, with the remainder presumably dumped at sea. No separate EIRR was calculated for this component due to its size relative to the other Project components.

4.16 Sensitivity Analyses. Sensitivity analyses were conducted separately for each of the above project components. In the case of the Phase IV component a standard analysis was used which included a 15% cost increase, 15% benefit decrease and 15% simultaneous cost increase/benefit decrease. The same assumptions were also used in the Dadaepo sensitivity analysis. However, here the analysis was expanded to gauge the project's sensitivity to environmental impacts and to compare the traditional method of evaluation with that including environmental impacts. The results are as follows:

SENSITIVITY ANALYSES

	Dadaepo (%)	Phase IV (%)
Base Case (with net environmental and land reclamation benefits)	34	25
15% cost increase	31	23
15% benefit decrease	30	23
15% cost/benefit difference	25	21
Base case without environmental improvement from relocation of plants[2]	23	
Traditional case with land reclamation[3]	32	
Traditional/environmental case without land reclamation [4]	11	

4.17 The results show that the Dadaepo component remains well justified as long as the main benefit, land reclamation, value is included no matter which of the other benefits (various environmental related factors) are excluded (see footnotes to the above table). However, in the traditional analysis, which disregards land value changes and includes only the transport economic savings in ship waiting time, inland transport cost savings, and cargo handling cost savings the project becomes economically unfeasible. The above analysis indicates that the Pusan Phase IV component is well justified.

E. Risks

4.18 Other than uncertainties associated with traffic growth, the main project risks concern policy decisions, including: (i) enforcement of the removal of the timber and fish processing plants to Dadaepo as well as some of the off-dock facilities from the city's residential areas to on-dock and ICD facilities and the re-zoning of these vacated areas to exclude future industrial development; and (ii) private participation in the co-financing of both the Dadaepo and Kwangyang Bay facilities. The impact of these potential risks on the project are not expected to be very great or to reduce the likelihood of the project not achieving its anticipated benefits. The PCG has clearly stated its intention to transfer industrial operations, including the off-dock container yards, to areas designated as industrial and away from areas zoned for residential and commercial activity. The implementation of this policy has been delayed due

[2] Base case, but without the increased residential land values around processing industries to be relocated to Dadaepo (result of improved residential environmental quality).

[3]Includes only transport economics (costs and time) plus the value of reclaimed land for industrial processing purposes. All environmental costs and benefits are excluded.

[4]All transport economics (no land reclamation value, and no environmental benefits).

to the lack of suitable areas to properly accommodate these operations, but with the expanded space for the handling of container traffic with the Phase IV development and the new ICD at Yangsan and with the new industrial space being developed at Dadaepo, sufficient land will now be available. In addition, the private operators also have significant financial incentives to transfer to the new areas because the cost of the land at the new locations is substantially lower than the land on which they currently operate. By selling the land that they are currently using, they will be able to finance the construction of newer more efficient facilities at the new location.

4.19 The risk that the private operators will be able to finance the reclamation of the land at Dadaepo does not appear to be a concern. The operators involved in the move have formed a special committee to manage the reclamation and construction. The costs will be financed by the companies that have been selected to move to the Dadaepo site, and paid from the proceeds received by the companies through the sale of the land at their existing operations. If some of the companies prove to be incapable of financing their share of the cost, there are many other companies willing to replace them who would have the necessary funds in order to participate in an investment with such high rate of return. The risk associated with the financing of the new container berths at Kwangyang Bay also do not appear to be a concern since bids on three of the four berths have already been accepted and KCTA is reporting a strong international interest in the fourth berth.

V. FINANCIAL ANALYSIS

Korea Maritime and Port Administration

A. Past Financial Performance

5.1 Historically, the operating results for KMPA have been extremely good, however, during the four years ended in 1992, the financial performance of KMPA declined steadily. The reasons for this overall decline in profitability can be attributed to two primary factors. The operating expenses increased dramatically and the level of operating revenues was virtually constant. The increases in the operating expenses are the result of two major factors. The first was an increase in salaries due to pressure from labor to increase rates nation-wide. During this period, the total employment in KMPA increased by only 3%, but the salary expense increased by 61%. The second reason for the large increase in operating expenses is due to the Government's policy to revalue fixed assets to reflect market value. In 1990, the net fixed assets increased by over 90% largely due to this revaluation, and the depreciation expense increased by about 32% over 1989 levels. The impact of these two items was that operating expenses grew by over 65% during this four year period.

5.2 The second major factor explaining the decline in operating profits is that operating revenues showed virtually no growth during this four year period. This low level of growth is due to the fact that rental income declined by almost 50% in 1991 because when KCTA was created, KMPA no longer received the rental income from the container terminals (see paras 5.9 - 5.11). This reduction in rental income offset the increase in revenue from port facilities which grew at an annual rate of 8.7% during this period. This growth was the result of large increases in the total tonnage shipped, but since there were no port tariff increases during this period, the rate of growth for operating revenue was reduced. The combined impact of the reduced operating profits and the large increase in the value of the fixed

assets has reduced the rate of return on net fixed assets in operation below the target level of 5% (see para 5.8). These results are summarized below and presented in more detail in Tables 17-20.

	1989	1990	1991	1992
	(Won billions)			
Operating Revenue	132.4	136.2	136.0	138.5
Operating Expense	67.5	77.9	91.5	111.8
Working Ratio (%)	30.4	30.9	40.6	51.2
Operating Ratio (%)	51.0	57.2	67.3	80.7
Rate of Return (%)	5.2	3.0	1.6	0.9
Debt Service (times)	1.9	2.2	1.9	1.4
Self Financing Ratio (%)	NA	32.9	28.7	19.9

B. Current Financial Position

5.3 The financial position of KMPA remains extremely strong. The annual net cash flow from operations has been able to finance almost 30% of capital spending, and since KMPA is a government agency, the Government continues to provide almost 60% of KMPA's capital investment program. During the three years ending in 1992, the Government's net cash investment in KMPA was almost W462 billion. This very strong cash flow support has allowed KMPA to limit its borrowing program to specific situations and to balancing out its cash flow requirements. The result is that KMPA has a very strong capital structure with a debt to equity ratio of (1/26) or about 4% and a debt service coverage of almost 1.4 times. The current and acid test ratios are kept at low levels by the Government as efforts are made to balance the annual cash requirements.

C. Future Financial Performance

5.4 Effective January 1, 1994, all port generated revenues will be retained in the sub-sector for future capital investments. As part of this policy change, it has been decided to allow private operators to bid for the exclusive use of the various multi-purpose terminals in Korea. It is expected that this decision will be implemented at all of the 27 international ports by 1996. The Bank will work with KMPA in the implementation of this privatization policy (para 3.3 (e)(v)). The impact of this decision will completely change KMPA's forecasted operations by significantly increasing its operating revenues. At this time, it is not possible to predict the actual impact, therefore, the following forecast is based on the current operating procedures which should be indicative and should also represent a worse case scenario. (See para 3.5).

5.5 KMPA's operating margin is projected to steadily improve throughout the period and enable KMPA to return to the levels of profitability that it enjoyed in the 1980s. The forecast performance is illustrated by the data below which is derived from Tables 17-20.

	1993	1995	1998	2000
	(Won billions)			
Operating Revenue	183.7	237.1	360.0	464.6
Operating Expense	130.4	156.6	224.3	274.5
Working Ratio (%)	42.4	38.2	32.2	29.1
Operating Ratio (%)	71.0	66.0	62.3	59.1
Debt Service (times)	3.1	4.8	8.0	14.5
Self Financing Ratio (%)	17.7	27.3	28.3	50.9

5.6 The operating results of KMPA for the period 1989 - 1992 were negatively impacted by the abnormal social and economic conditions that existed in the late 1980s and early 1990s. The economic projections indicate continued growth in the economy, albeit at a slower rate than in the past, combined with normal increases in operating expenses. Cargo tonnage is expected to grow at an annual rate of over 5%, and the average price per ton of cargo is projected to increase at an annual rate in excess of 7%. This combination will allow KMPA's operating revenue to grow at an annual rate of over 16.3%. The growth in tonnage is well supported by historic and projected trends, but the increase in the port charges per ton is well in excess of recent trends where the Government has been very concerned about the inflationary effect of cost increases in the transportation sector and its negative impact on the competitiveness of Korean exports. Port tariffs were, however, increased by 5% effective January 1, 1994. This was the first tariff increase since 1990. The cargo mix will also have an impact on the average rate. Korea currently has a high containerization rate, but all indications are that the port charges per ton will continue to increase as containers are able to penetrate new markets. Since containers are high priced but low tonnage cargo, the average charge per ton of cargo will increase as the amount of container cargo increases.

5.7 As a result of the Government's policy of revaluing fixed assets to their market level, and the rapid increase in the Government's capital spending program, the net fixed assets in operation are projected to grow at an annual rate of almost 14% during the forecast period. This rapid growth in the value of the fixed assets in operation prevents the rate of return earned on these fixed assets from improving during the period despite the significant growth in the level of profitability as can be seen from the following table:

	1990	1994	1997	2000	Percentage Increase
	(Won billions)				
Operating Income	58.3	62.6	112.7	190.2	226
Average Net Fixed Assets in Operation	1,955	3,759	5,766	8,486	334
Rate of Return (%)	3.0	1.7	2.0	2.2	2.2

5.8 When the Government proceeds with its stated intention to privatize the operations of the port system, KMPA will be able to reduce its operating expenses and the fees received from renting the general and multi-purpose port facilities will increase the operating revenues. It is not possible to accurately determine the impact of this policy change, but the privatizing of these terminals will generate more revenue for KMPA which can then be re-invested in the sub-sector. Due the new importance of financing the ports' capital expenditures from operations, it was agreed to use a self financing ratio to monitor the financial condition of both KMPA and KCTA rather than the rate of return on the amount of net fixed assets in operation. Assurances were obtained during negotiations that KMPA and KCTA should each generate sufficient cash from operations so that when combined with the cash and short-term securities on hand at January 1 of the year the total represents not less than 20% of the annual average capital expenditures for that year and the next year for KMPA and 40% for KCTA.

Korea Container Terminal Authority

D. Operating Results

5.9 The law establishing the KCTA was passed in December 1989, and KCTA started operations in April 1990. KCTA was created for the purpose of developing, managing and operating the container

handling facilities in Korea. When KCTA began operations, the rights to operate the Pusan Container Terminal Operating Company (PCTOC) and the Pusan East Container Terminal (PECT), and the corresponding long term debt incurred to construct them, were transferred to it by KMPA. As an authority, KCTA is permitted to retain the profits from renting these port facilities in order to invest in other container handling facilities such as the Pusan Phase IV Container Terminal and the Phase I Container Terminal in Kwangyang Bay.

5.10 In order to generate the maximum amount of cash from its operations, KCTA amortizes the port operating rights that it received from KMPA over a period of five years. Since the value of these rights represented almost 75% of KCTA's total assets in 1990, the annual amortization also represents about the same percentage of KCTA's operating expenses which has enabled KCTA to retain almost 90% of its operating revenue in the form of cash to be invested in future facilities. A brief summary of some key operating and cash flow data are presented below and set out in more detail in Tables 21-24.

	1990	1991	1992
	(Won billions)		
Operating Revenue	13.1	36.1	37.7
Working Expense	1.9	4.5	5.3
Operating Expense	9.2	19.3	19.9
Cash From Operations	2.0	27.4	34.2
Working Ratio (%)	14.5	10.9	12.8
Operating Ratio (%)	70.3	53.5	52.8
Rate of Return (%)	6.0	28.2	39.3
Debt Service Cov (times)	n/a	3.3	3.2
Self Financing Ratio (%)	n/a	1,928.0	226.0

5.11 In order to meet the forecasted need to handle in excess of 4 million TEUs by the year 1996, KCTA is currently constructing two four berth container terminals. In order to finance the construction of these facilities, KCTA will borrow a total of about W370 billion between 1993 and when the construction is complete in 1997, but it will finance in excess of 35% of this capital cost from its operations. This will place some pressure on KCTA to continue to generate sufficient cash to service its large portfolio of public and private debt, but since the forecasts project large increases in the volume of container traffic moving through the terminals, the terminal operating companies should not experience any difficulty in making the rental payments on the facilities. As the following table summarizes, KCTA

consistently generates large cash flows from its operations by controlling its working expenses, and by producing a steady stream of rental income from its container handling facilities:

	1993	1995	1997	2000
	---------- (Won billions) ----------			
Operating Revenue	40.4	50.9	62.1	87.9
Working Expense	5.4	6.3	7.5	10.3
Operating Expense	20.0	14.6	13.9	25.6
Cash From Operations	32.7	36.1	22.0	22.4
Working Ratio (%)	12.6	11.2	11.2	10.9
Operating Ratio (%)	49.5	28.8	22.5	29.2
Rate of Return (%)	68.0	155.2	15.5	15.5
Debt Service Cov (times)	3.3	2.4	1.4	0.9
Self Financing Ratio (%)	104.5	58.7	135.7	---

E. Sensitivity Analysis

5.12 There was no sensitivity analysis conducted for the operations of KCTA since as a "land lord" port authority, it is somewhat insulated from the normal risks associated with operating large port facilities. Each of the leases with the terminal operating companies has minimum throughput requirements which gives KCTA protection against a decline in volume and provides the opportunity to participate with the operators in volume increases above the minimum. No sensitivity analysis was done for KMPA even though it is subject to more risk of a reduction in port charges (from a reduction in both the number of ships and the total tonnage) because the number of variables involved makes any meaningful analysis unlikely.

VI. AGREEMENTS REACHED AND RECOMMENDATION

6.1 During negotiations, assurances were obtained from the Government that:

(a) the Government will cause KMPA and KCTA to have their financial statements and those of each of the DMPAs audited by independent auditors acceptable to the Bank. Such financial statements and audit reports would also include a separate opinion from the auditor on disbursements made using Statements of Expenditures (SOE) and on the IBRD Special Account for the Bank loan. Such statements and audit reports would be submitted to the Bank within eight (8) months of the end of each fiscal year (para 1.18);

(b) KMPA will submit a proposal to the Bank identifying the participants and programs for the extended study portion of the environmental training programs no later than November 1 of the year preceding the training (para 3.3(e)(iii));

(c) KMPA will submit a proposal to the Bank identifying the participants and program for the operational and technical training program no later than November 1 of the year preceding the training (para 3.3 (e)(iv));

(d) No disbursements will be made with respect to the Dadaepo component until KMPA provides the Bank with satisfactory evidence that the EIA for Dadaepo has been approved by MOE (para 3.22);

(e) Resettlement of the affected people will be done in accordance with the following principles and objectives: that the people shall be consulted and participate in the design and implementation of the resettlement activities, and at least 30 days prior to their displacement, each affected person shall be provided with a compensation package, in cash or in kind, sufficient to ensure that each affected person shall improve or at least regain, the standard of living and means of livelihood that they were enjoying prior to their displacement. In addition, each compensation package shall include (a) compensation for the assets lost, or at least, at replacement costs; and (b) adequate subsistance allowance during the transition period of resettlement (para 3.25);

(f) KMPA would be required to submit to the Bank the monitoring results/reports on the Dadaepo component which are required by MOE by March 31 of each year starting in 1996 (para 3.32);

(g) KCTA would be required to submit to the Bank the monitoring results/reports on the Pusan Phase IV component as required by MOE by March 31 of each year starting in 1996 (para 3.33); and

(h) KMPA and KCTA should each generate sufficient cash from operations so that when combined with the cash and short-term securities on hand at January 1 of the year the total represents not less than 20% of the annual average capital expenditures for that year and the next following for KMPA and 40% for KCTA (para 5.8).

6.2 Subject to the above assurances and conditions, the proposed project constitutes a suitable basis for a Bank loan of US$100 million equivalent, for a period of 15 years, including a grace period of five years, at the Bank's standard variable interest rate. The borrower would be the Republic of Korea.

KOREA

PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Yellow Sea Large Marine Ecosystem Program

Background

1. Situated between the Korean Peninsula and the Chinese mainland,the Yellow Sea is a semi-enclosed, shelf-type shallow sea. It is bounded on the north by China's Liaodong Peninsula, adjoins the Korea Peninsula on the east, borders the East China Sea on the south and the coasts of China's Shandong and Jiangsu Provinces on the west. It is approximately 380,000 Km^2 in area, with shallow depths averaging 44 meters.

2. Because of its size and semi-enclosed nature, the Yellow Sea functions as a large marine ecosystem. The Yellow Sea Large Marine Ecosystem (YSLME) is characterized by unique bathymetry, hydrography, productivity and tropically linked populations of living marine resources, which distinguish it from the Bohai Sea to the north, and the East China Sea to the South.

3. The YSLME is inherently international in nature, bounded by China to the west and South Korea and North Korea to the East. Water and living marine resources circulate freely within the international waters of the YSLME, and sometimes beyond. Therefore, environmental problems generated at any point in the YSLME potentially affect each country. Because the YSLME is a semi-enclosed continental shelf-type shallow basin, it has reduced water exchange with the open ocean. Any persistent pollutants introduced to the system therefore have a high residence time.

4. In recent years, the YSLME has suffered increasingly from anthropogenic perturbations. Levels of pollution, particularly in the northern areas and throughout the coastal zone, have trended upward, and significant decreases in the biodiversity of coastal marine communities have been documented. In addition, biomass yields from living marine resource populations have decreased precipitously due to overfishing and coastal habitat loss. Both Korean and Chinese fishery scientist have described significant decreases in yields of important commercial fish stocks such as the yellow croaker, probably due to overfishing. The coastal zone of the YSLME in particular has been impacted by human activities, such as offshore oil and gas development, seaport construction and expansion, shipping, water conservancy projects, land reclamation, mariculture and discharges of pollutants from various sources.

5. To help address these environmental concerns in the international waters of the YSLME, the World Bank and the Global Environment Facility (GEF) have pursued a policy of assisting China and Korea to develop ship waste collection and disposal facilities in some ports bordering the YSLME. The Port Development and Environmental Improvement Project will assist Korea in the development of such ship waste facilities. Anticipated benefits of these facilities include reduction of pollution levels in the shared waters of the YSLME. However, these facilities only address one aspect of the problem. Also, a means is required to assess the environmental benefits (or lack thereof) of the port facilities.

6. In order to fully address the multiple disturbances now affecting the YSLME, a more comprehensive program for monitoring and mitigation will be established. The program will be synoptic, monitoring pollution, ecosystem productivity, biodiversity and changes in fisheries production. In addition, the program will be international, involving both Korea and China, the countries which have most significant impact on the health of the YSLME and its resources.

Objectives

7. The overall objective of the program is to monitor sources of stress on the YSLME, particularly those from pollution, degradation of coastal habitats, and overfishing, and to provide this information in a usable form to decision-makers. This information can then be used to determine options for improved ecosystem management and reduction of anthropogenic stresses on the YSLME. An essential element of the program will be to ensure appropriate cooperation between Korea and China in monitoring and assessment.

Specific objectives for the project are to:

(a) Implement a comprehensive monitoring and assessment program for the YSLME, led by the Korea Ocean Research and Development Institute (KORDI);

(b) Provide appropriate equipment for marine monitoring and assessment, and training for KORDI staff;

(c) Establish an international GIS data base for the YSLME containing information on pollution, living marine resources, biodiversity, major ecological parameters and specific policies and practices in marine management, both domestically and internationally; and

(d) Coordinate monitoring and assessment activities between Korean marine scientists and managers and their counterparts in China.

The YSLME Monitoring Program

8. The monitoring activity consists of two modules: (a) Ecosystem Productivity and (b) Living Marine Resources (includes pollution monitoring and analyses). The activities in each operational module were designed by scientists from Korea and China, and consultants from United States (National Oceanic and Atmospheric Administration (NOAA)) and the U.K., who met together during the First and Second International Workshops on the Collaborative China/Korea Joint Monitoring Program for the YSLME, held in Qingdao in May, 1993, and Seoul in November, 1993, respectively. Additional meetings were conducted with Korean agencies December 1993 and February 1994. Although this is a cooperative program between Korea and China, the Korea Ports Development and Environmental Improvement Project will support only those activities occurring in Korea. Chinese support will be provided through a separate proposal to the Global Environment Facility.

Ecosystem Productivity Module

9. This module will monitor primary and secondary productivity in the planktonic community as well as abiotic environmental factors. Monitoring will be conducted primarily using instrumented continuous plankton recorders (CPR) and undulating oceanographic recorders (UOR) in a program of regular transect surveys across the YSLME from Korea to China. CPR and UOR are instruments towed behind ships-of-opportunity (commercial vessels traversing fixed routes) making quantitative collections of phytoplankton and zooplankton while measuring physical, chemical and biological variables including temperature, salinity, dissolved oxygen, irradiance, chlorophyll, nitrate/nitrite, petrogenic hydrocarbons, productivity, bioluminescence and turbidity. This suite of measurements, along with the plankton collections, will allow scientists to determine the seasonal variability and general health and productivity of the ecosystem, and provide some information on biodiversity and pollution levels.

10. Additional data on physical and chemical oceanographic parameters will be provided by the National Fisheries Research and Development Agency's (NFRDA) serial oceanographic cruises. These have been conducted on a monthly, bi-monthly or quarterly basis since 1960 on a series of transects surrounding the Korean Peninsula. Data include temperature, salinity, oxygen and pH at the surface and at regular depth intervals. These time series will be of use in assisting interpretations of CPR/UOR data, as well as general oceanographic conditions in the Korean coastal waters of the YSLME.

11. CPR/UOR surveys will also be enhanced with synoptic views from satellite remote sensing. Recent studies of sea surface temperature (from the NOAA Advanced Very High Resolution Radar satellite) and ocean color have established the importance of regularly collected satellite data for large ecosystem studies, for determining the extent and frequency of harmful algal blooms, and for detecting spatial changes in productivity related to near-coastal eutrophication.

Living Marine Resource Module

12. The module will provide information on the status of stocks of living marine resources and their environment. It consists of fisheries-independent trawl surveys conducted using research vessels, and processing and analysis of the resulting data. These surveys will:

(a) Make collections of demersal and pelagic fishes using bottom and mid-water trawls;

(b) Use hydroacoustic gear to estimate biomass and species composition of fish stocks when feasible;

(c) Collect samples of fish tissues, sediments and water for contaminant loading analyses; and

(d) Collect ichthyoplankton and benthos samples.

13. Surveys will be conducted simultaneously on a quarterly basis by Korean and Chinese vessels on a 30 minute X 30 minute grid across the YSLME. This will comprise a total of 213 stations divided between both countries. Since some interaction and fish stock exchange exists between the YSLME and the East China Sea LME, particularly for important commercial species, the area of survey coverage will extend to 31°N. Korean scientists will conduct pilot systematic sampling during the first year to establish more accurately the survey area, with stratified sampling conducted subsequently.

Surveys will be conducted with KORDI's R/V Onnuri, or with similarly equipped vessels from the Korean research fleet. Each quarterly survey will take approximately three weeks. Initially, surveys will be conducted in December, late March-early April, June, and October, in consideration of observed fish migratory patterns.

14. Collection of samples for pollution monitoring will occur during living marine resource surveys. In addition, petrogenic hydrocarbon levels will be monitored during the CPR/UOR surveys. Samples will be collected on a 2 degree x 2 degree grid during the course of the fish surveys, with more spatially intensive sampling near the mouth of the Yangtze River, and in the northern YSLME. Specific compounds of interest include pesticides, organophosphates, aromatic hydrocarbons, nutrients, methyl mercury and heavy metals (Cu, Cr, Ni, Pb, Co, Zn, Hg).

Sample Processing and Data Analysis

15. KORDI's Division of Biological Oceanography will provide the processing and analysis of plankton samples from the CPR/UOR surveys, as well as remotely-sensed temperature and ocean color data. Additional technician-level assistants will be required for plankton sorting and analysis, as well as for logistical operations, and maintenance of both electronics and the actual plankton recorder mechanisms.

16. The Division of Biological Oceanography is well equipped, with sufficient microscopes and computer equipment to support analysis activities. Some specialized equipment, such as specialized microscope stages for examination of CPR/UOR samples, will be provided.

17. For living marine resource surveys, KORDI is fully equipped and will conduct basic catch sorting, morphometric measurements, identification of species, analysis of fish samples for gross pathology, and analysis of stomach contents. NFRDA and KORDI will cooperate on age and growth analyses, and on fisheries stock assessment and hydroacoustic survey analysis.

18. KORDI's Chemical Oceanography Laboratory is fully equipped and prepared to analyze fish tissue, water and sediment samples for pollutants. Equipment includes both atomic absorption spectrophotometers and gas chromatographs with appropriate detectors.

Data Syntheses and Dissemination of Results

19. At the completion of each full year of monitoring (July '95, '96, '97) and upon completion of data processing and analysis, a workshop will be held to integrate results from an ecosystem perspective, and produce assessments of YSLME health. Five indices of ecosystem health will be evaluated quantitatively for the YSLME: diversity, yield, stability, resilience and productivity.

20. On the basis of these results, detailed reports will be prepared describing the status and health of the YSLME, and recommending specific options for mitigation of problem areas. These reports will be prepared in formats that are compatible with examining options for management decisions for mitigating problems with coastal habitat degradation, pollution and water quality, and depleted living marine resource populations. The reports will be provided to the Ministry of the Environment and the Ministry of Science and Technology for use in developing management plans for the YSLME. These reports will also contain annual program progress reports to MOST and the World Bank.

21. Assessment results will also be integrated between Korea and China. According to the GEF work plan, Chinese scientists will conduct identical annual assessments for their survey data. Upon completion of the separate Korean and Chinese assessments (August 1995, 1996, 1997), annual joint workshops will be held to integrate the results across the YSLME survey area and to produce a joint report on the status of the YSLME which will be distributed to appropriate environmental management and regulatory agencies in both countries. These annual workshops will also be used to calibrate between Korean and Chinese scientists conducting the same monitoring and assessment activities.

Institutional Arrangements

22. KORDI will be the lead agency for the Korean portion of the program. Terms of reference for KORDI's participation have been prepared. The National Fisheries Research and Development Agency (NFRDA), the National Fisheries University of Pusan and Kunsan National University will also participate.

23. KORDI is a diverse institution which can carry out a broad scope of work. Divisions within KORDI include Physical Oceanography, Chemical Oceanography, Biological Oceanography, Marine Geology and Geophysics, with a laboratory for Marine Environmental Engineering, a Polar Research Center and a Department for Ocean Data and Computer Services. Researchers within these areas have a very broad range of interests and capabilities which will contribute effectively to the multidisciplinary monitoring program.

24. KORDI's near-term strategic plans also include strengthening marine environmental research capabilities to cope with increasing pollution in the marine environment from industrial sources. KORDI will participate in Korea's Marine Environmental Management System, which is being established together with other marine and environmental institutions. This group will implement a National Project on Marine Environmental Preservation to monitor marine water quality, and assess ecological impacts of marine pollution. The YSLME monitoring program will contribute valuable information to the network.

25. KORDI also has a strong capability in fisheries stock assessment. Researchers in the Applied Ecology Laboratory have conducted stock assessments for fish both in the YSLME and other areas of the Pacific and are familiar with current assessment techniques. Recently, KORDI researchers have developed comprehensive PC-compatible software for stock assessment, which includes multiple models for stock parameter estimation, stock size analysis and management parameter estimation.

26. In China, the State Oceanographic Administration (SOA) will be the lead agency and KORDI's counterpart for this program. SOA will be assisted by the Yellow Sea Fisheries Institute, Academia Sinica and other institutions engaged in oceanographic research, marine pollution monitoring, and living marine resource assessment and development.

Training

27. Given the well developed technical capacities of KORDI and other participating Korean technical agencies, relatively little training is required to prepare for monitoring and assessment activities. Training programs will be required in the following areas:

(a) Use of CPR/UOR (mechanical and logistical);

(b) CPR/UOR sensor electronics; and

(c) Hydroacoustic techniques.

28. As part of ongoing training and capacity building activities, six scientists and technicians participating in the program will be provided support to attend one international scientific meeting annually focused on LMEs, marine science, fisheries, marine pollution, or ecosystem management. The participants will present papers at these conferences on the results of the YSLME monitoring program. Candidacy for participation will be rotated among participating institutions depending on meeting topics and areas of specialization.

GIS Database/Data Management

29. An important element of this program, considering the amount of data being produced, the number of users of these data, and the necessity to create diverse data sets for ecological analysis, is data management. A data management system will be designed to ensure a smooth and consistent flow of data between source, user and repository. Elements of the system will include:

(a) Establishing consistent data collection and recording methods;

(b) Transferring data effectively from the field or laboratory to an appropriate database at KORDI and/or other institutions; and

(c) Harmonization of data management techniques between KORDI and other participating institutions both within Korea and in China.

Program Coordination

30. Successful implementation of this program will require cooperative efforts across the disciplines, institutions and countries involved. Appropriate organization and coordination are essential for integrating various efforts to serve the overall objective of the program. Therefore, mechanisms for organization and coordination of the implementation will be developed at both national and international levels. KORDI will serve as lead Korean institution and focal point for the YSLME program. In this capacity, KORDI will also serve as focal point for the Bank and its consultants, and will be responsible for implementing the project work plan in a timely manner, and preparing annual reports and other updates as may be required.

31. Coordination between Korea and China will be achieved through an International Coordination Group (ICG) and an International Scientific Steering Group (ISSG). These groups will coordinate administrative and scientific matters to maximize harmonization between the Korean and Chinese monitoring and assessment programs.

32. The International Coordination Group is to be composed of National Coordinators designated by the participating countries, the representatives from participating international funding agencies (World Bank, UNEP, UNDP, etc.), and the Chairman and Vice-Chairman of the International Scientific Steering Group (see below). Secretariat services will be provided by SOA or KORDI. The proposed terms of reference for the ICG are to:

(a) Examine the formulation and implementation of the related programs and projects conducted by the participating countries and take actions, as appropriate, to coordinate the related activities;

(b) Review the work of the program and to make decisions to improve the plan and its implementation;

(c) Examine the reports from the ISSG and to take actions, as appropriate, on the recommendations contained in the reports;

(d) Encourage and promote exchanges of personnel and scientific results; and

(e) Provide guidance for the implementation of the action plan and to facilitate the provision of conditions and safeguards stipulated in the present program plan.

33. The International Scientific Steering Group is to be composed of one or two scientists from each country, representatives of the international funding agencies and some invited scientists. The membership of the ISSG should represent the broadest possible range of the major disciplines involved. The proposed terms of reference for the ISSG are to:

(a) Examine the formulation and implementation of scientific programs and projects conducted by the participating countries and regions and to provide guidance in the design and execution of these programs and projects, in accordance with the overall objective and requirements of this action plan;

(b) Provide advice for improving the program and its implementation;

(c) Review the scientific results from each the program and to make recommendations to improve the scientific plan and its implementation;

(d) Submit working reports to the ICG, and to undertake the scientific work recommended by it;

(e) Promote, and provide guidance for, the training of personnel, the provision of technical advice and the exchange of the research results needed for implementing the action plan; and

(f) Review, and to prepare reports of, scientific results from the action plan and to provide guidance on the publication and dissemination of these results.

KOREA

PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

SHIP WASTE DISPOSAL FACILITIES

Terms of Reference

Introduction

1. In recent years, deliberate, negligent or accidental release of oil, oily wastes, noxious liquid substances etc. from ships resulting from marine traffic congestion and the expansion of world tonnage has constituted a serious source of marine pollution. The International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978 (MARPOL 73/78), was promoted by the International Maritime Organization (IMO) to prohibit all ships from discharging wastes into the sea which could result in pollution of the marine environment. These wastes include oils, garbage, noxious substances and sewage. MARPOL 73/78 applies to all ships including oil tankers, cruise ships, general cargo and container vessels, tugs, ferries, yachts and small pleasure craft.

2. MARPOL 73/78 has currently five annexes covering discharges from ships:

- Annex I: oily wastes such as ballast water and slop from oil tankers; oily bilge water from engine room and other spaces; fuel residues; and, waste oil.
- Annex II: noxious liquid substances in bulk--tank residues after discharge of cargo.
- Annex III: harmful substances carried in packaged form, in freight containers, portable tanks.
- Annex IV: sewage (this annex is not yet in force because of limited worldwide sewage port reception facilities at present).
- Annex V: garbage--including food wastes, plastics; oily rags; packing materials; and dunnage.

3. MARPOL 73/78 requires that ships retain all the wastes on board and deliver it to shore reception facilities at the first port of call unless they meet the specified criteria which enable them to discharge the waste at sea. The Convention also stipulate various requirements for ship construction and equipment criteria to minimize discharge of marine pollutants from ships and requires the Government of each Party to undertake the provision of reception facilities according to the needs of ships using its ports, terminals or repair facilities. The Convention requires such reception facilities to be able to receive and treat residues and mixtures containing oil and noxious liquid substances without causing undue delay to the ships wishing to use such facilities.

4. As a result of Korea's ratification of the MARPOL Convention, Korean Law no. 4365 was passed. The law requires every Korean port authority to arrange for the provision, operation and maintenance of adequate facilities, the collection, treatment and disposal of wastes generated by vessels

calling at Korea's ports. This study will, inter alia, form the basis for the development of ship waste disposal facilities (SWDF) in Korea.

5. Attached is a background paper to assist the consultants in their study and deliberation and to provide an indication of the coverage expected in the assignment.

Objectives of the Study

6. The study will formulate and evaluate investment options, policies and strategies relating to the collection, storage, treatment and disposal of ship wastes. The study will also develop detailed engineering design of the main elements of the collection, storage, treatment, disposal and the associated site facilities for the recommended locations. In particular, the study will provide recommendations on:

(a) how the wastes from vessels calling at Korea's ports are to be collected, stored, treated and disposed of;

(b) the type and extent of facilities that have to be provided to receive and treat the wastes and their locations;

(c) how the proposed facilities can be integrated with the existing private or public facilities to minimize overlap and to provide economy of scale;

(d) the design and estimate of costs with respect to new facilities that have to be constructed as well as the specific improvements, additions or modifications that have to be made to the existing facilities;

(e) the method of recovery of the cost of investments, operation and maintenance of the facilities including the role of the private sector in providing this service;

(f) institutional and organizational options for successful implementation of the reception facilities with particular reference to the role of KMPA, the Coastguard and the MOE; and

(g) the adequacy of current laws and regulations, and the ways and means by which legal and statuary requirements regulating the discharge of wastes in ports can be met and enforced.

Scope of Work

7. The study will:

(a) identify and list the existing facilities including their ownership, location, MOE and local certification status, capability etc. for the reception, treatment and disposal of ship wastes;

(b) estimate the present and forecast the future volume of ship wastes that will be generated by type for each of the 27 ports for the period 1994-2003 by using a stratified sample survey;

(c) explore the opportunities for recycling and for alterative use of the waste;

(d) based on the above and taking into consideration other relevant factors, identify what additional facilities are required including the secondary ports which can be utilized as

"hub" systems to collect wastes from coastal vessels. Determine where these facilities are to be located and propose a prioritized implementation program;

(e) provide designs and cost estimates for new construction including the "hub" facilities and for improvements and modifications to the existing facilities;

(f) identify institutional and/or other barriers which presently or potentially could inhibit the implementation of MARPOL 73/78 requirements. (Possible examples of such barriers would include insufficient incentives and/or lack of deterrents for ships to discharge their wastes legitimately, prohibitive investment costs of new facilities, inadequate legislation and mechanism for enforcement, lack of private sector incentives etc.);

(g) review the adequacy of current laws and regulations and recommend changes; and

(h) propose institutional and organizational options for successful implementation and operation of the proposed facilities and in particular the role of private sector and the government with regard to ownership, control, incentives, day-to-day operation, monitoring, enforcement, cost recovery, etc.

Implementation Plan and Reporting

8. Consultants are required to include in their report an implementation plan which:

(a) incorporates short, medium and long term plans;

(b) establishes a time table for the completion of those developmentsthat are to be undertaken following the study;

(c) provides cost estimates for the recommended developments; and

(d) recommend a comprehensive plan of action (physical, institutional and legislative).

Reporting

9. Reports will be prepared in English as well as Korean as follows:

(a) Inception Report: within two months of initiation of work.

(b) Draft Final Report: within six to eight months of initiation of work.

(c) Final Report: within one month of receipt of comments from KMPA and the World Bank

Attachment

Background Paper

Categories of Ship Wastes

1. There are four basic categories of ship generated wastes: oily wastes; garbage; sewage and noxious liquid substances (chemicals).

2. **Oily Wastes:** All propelled ships, irrespective of size or type, generate oily wastes - usually some oil mixed with much larger quantities of sea water. A ship may generate four types of oily wastes. These are: (i) oily bilge wastes; (ii) dirty ballast water; (iii) tank washings; and (iv) oily residues and liquid and solid sludge.

(a) **Oily bilge wastes:** Bilge water accumulation at sea varies widely and depends on the age of the ship, the type of machinery and the standard of maintenance and housekeeping on the ship. Oil and grease in the bilge originate from leaks and spills in the engine room and from machinery and auxiliary equipment in other parts of the ship. Generally, older vessels and poorly maintained vessels generate more oily wastes. Also, when routine maintenance or emergency repairs are carried out on engines and machinery, oils are often changed and the used oil must be disposed of. Thus, the bilge may contain a mixture of oils and water and other spilled substances. Traditionally, the bilge room is kept as dry as possible and automatic pumps operate continuously discharging the contents directly into the sea. Often, however, oils are separated and retained on board.

A typical ship may generate about 4.5 tones of bilge oil per year. Other sources quote bilge waste generation rates ranging from 1 to 15 tones per day for ocean tonnage and from 0.1 to 3 tones per day for coastal tonnage for well-run vessels. A ship in port will generate substantially less bilge water than when the machinery is under power at sea.

(b) **Dirty ballast water:** All oil tankers when not carrying cargo travel with their tanks partly full of sea water to "ballast" the ships and make it stable. When a crude carrier arrives at a loading port, it must first discharge its ballast water. Typically this is done at sea just before entering the port or at the terminal if the terminal can accept ballast water. Older generations of tankers use their cargo tanks to hold the ballast water. Thus dirty ballast water may consist of a large volume of sea water, normally about 10%-30% of the dwt of the vessel (i.e. a 100,000 dwt tanker may discharge about 10,000-30,000 tones of dirty ballast) mixed with small quantities of oil. The amount of oil and cargo residue entrained with the ballast towards the end of the discharge from the ballast tanks may amount to between 0.4 and 1 per cent of the volume of the dirty ballast in any tank. Modern tankers have "segregated" ballast tanks used only for ballast water and therefore do not require on-shore ballast receiving facilities except under abnormal voyage conditions.

(c) **Tank washings:** Even the new generations of petroleum products carriers with their segregated ballast tanks need to clean their tanks when changing from one type of cargo to another and the port/terminal must be able to receive these tank washings called the "slops". The wash water quantity will be small in comparison with the quantity of dirty ballast and

may be in the order of 5 percent of dwt. The amount of cargo residues floating in the slop tank may be of the order of 0.2 percent of the total cargo capacity of the ship. A tanker may discharge a cargo at a terminal and be required to load a cargo of different product at the same terminal. In such a case, reception facility is required to accept the tank washings as the tanker cleans its tanks. There are also techniques, such as "retention-on-board" (or "load-on-top"), which enable tankers to avoid discharging oily ballast water ashore.

(d) **Oily residues and liquid and solid sludge:** Another major source of marine pollution comes from the discharge of fuel and lubeoil residues which is collected in fuel separators and at the bottom of the fuel tanks which can amount to 1% of the fuel oil consumed. This material is almost solid and although some of it may sink at the bottom of the sea, other may find its way to shore and result in the familiar 'tar balls' found on beaches. A ship can generate about 0.25 tones of residue per day depending on the fuel quality and consumption.

3. For the most part, modern ships will carry separate ballast tanks, and if they do not, national authorities could require ship owners to modify their ships and install segregated ballast tanks. At an installation cost of around US$100,000 per ship, the feasibility of this alternative is not unrealistic. It has been estimated that in 1992 in Korea, 46,000 tons per annum of oily waste and sludge, originating largely from the operations of small to medium sized coastal and fishing vessels required attention. Of the 46,000 tons, approximately 16,000 tons were received for treatment by private ship waste disposal facilities (SWDF) in Korean ports (Ulsan, Inchon, Pohang, and Yeosu). (In addition, approximately 5,000 tons were received in Pusan for transport by tanker trucks to treatment at an unauthorized waste treatment facility in Yangsan). The remaining 25,000 tons of the dirty oily waste is not readily accounted for. Given the rapidly increasing environmental consciousness and interest among Korean for a clean coastline for productive and leisure activities, it is in the public interest to implement a system to secure this fragile natural resource from oil spills and routine discharges of destructive oily substances, as well as the disposal of other ship waste including sewage, garbage, chemicals and hazardous wastes.

4. In order to determine more accurately the amounts of oily waste that may require some form of treatment the Korean Maritime Training and Research Institute (KMTRI) has completed a careful technical survey of oil consumption for different on-board activities, and estimated the waste generation, for a sample of 120 vessels. By using regression analysis the relationship between ship characteristics and oily waste generation can be established and used in determining the future SWDF capacities.

5. It is the small coastal vessels lacking on-board facilities for environmental treatment of ship waste, which presently cause the most harm. In 1991, a total of some 222,000 coastal vessels (many of which were fishing vessels) made port calls in the 25 major Korean ports. Inchon, with 38,063 port calls received the highest number of coastal vessels, followed by Mokpo with 24,258 and Cheju with 23,995. In addition, five more ports Pusan, Ulsan, Kwangyang, Kunsan, and Chungmu, handled from 13,000 to 19,000 coastal vessels per year. The remaining ports handled substantially less coastal traffic. The eight ports noted above, located around Korea, handled more than 70% of total coastal ship traffic in 1991. As a result, it is expected that the initial focus of development would be on these eight ports, which would be designated as possible "hubs" for ship waste treatment and disposal. Private ship waste treatment facilities are presently found in Cheju, Tonghae, Mokpo and Kunsan, in addition to the tank cleaning facility in Ulsan. Storage tanks are found in eight other ports: Taesan, Pyongtaek, Kojong, Wando, Kwangyang, Yosu, Masan, and Sokcho. The private companies are facing serious financial problems due to low volume of wastes and the resulting low income. The low volume may be due to more ships being equipped with on board facilities or due to illegal disposal.

6. The proposed development of the SWDF will need to take into account how changes over time in the ships' own facilities for waste storage and treatment will affect the demand for the SWDF services. The expected increase in on-board equipment for storing and processing ship waste must be incorporated into the analysis along with the forecasts for the growth and composition of ship traffic. The expectation of low volumes can become a major factor in discouraging potential investors to develop SWDF.

7. The quality and recyclability of the sludge and oily waste, also need to be established. Since oily waste and sludge appear in a 5:1 ratio no collector of oily wastes is interested in collecting sludge. The sludge is messy with high asphaltic and solid contents. However, to the extent that there is a market for recycled products from oily wastes, the collection of sludge can be made a compulsory pre-requisite to the free collection of oily waste. The analysis should therefore establish whether such an oily waste/sludge product could be sold at below coal price level and remain attractive for contractors. At present it appears that oily waste is used to generate heat/power to operate treatment facilities, reducing the ultimate cost of waste treatment operations.Most modern container and other large oceangoing vessels have on-board facilities to burn the oily sludge. The heat and steam which is generated can be used economically on the vessel.

8. When tankers change cargo the tanks must be cleaned. Whereas such tank cleaning operations formed the basis of profitable private tank cleaning facilities for ULCCs and VLCCs in Korean ports such as Pusan and Ulsan in the 1970s and early 1980s, such services have since shifted away from Korea to neighboring countries where costs are lower. As a result, the tank cleaning and oily ship waste treatment facilities in Pusan were shut down and eventually dismantled in 1992. The facility in Ulsan on the other hand was able to adjust to changing market conditions and take on a sufficient volume of tank cleaning tasks for land-based stationary tanks when the ship cleaning activity in Korea declined.

9. Experience with vessel sludge and oily waste in places like Norway and India indicate that waste oil can be recycled to fuel oil or even diesel, and sold as a substitute for coal, diesel or heavy fuel oil to land based energy intensive small-scale industry. Any analysis conducted to determine the situation in Korea should examine the prospective size and growth (if any) of a market of this type. In order to do this, the analysis should establish:

(a) Whether a substitute fuel market exists in Korea, for example in land-based energy-intensive small scale industry, or in the operation of waste treatment plants;

(b) What amounts of oily waste and sludge are economically recyclable, and what amounts must be deposited for incineration;

(c) What would be the actual fob-price (border price) of such recycled fuel in terms of the substitute it may replace;

(d) What are the all-inclusive unit costs of collecting, transporting and processing oily waste to derive a marketable substitute waste oil fuel, or to burn it for heat generation;

(e) What annual volumes, and what future growth is anticipated for this potential revenue generating--or cost saving-- market;

(f) Will the revenues from such a processing facility suffice to amortize the capital, cover operating and maintenance cost, and yield an acceptable rate of return on invested capital; and

(g) Should the processing facility pay for or receive for free, the sludge and oily waste to be recycled as an incentive to ships to use the facilities, or should the ships pay to deliver their oily waste and be monitored and audited carefully by a port personnel.

10. **Garbage:** All vessels of all types and size generate garbage. It originates from:

(a) the crew and passengers and consists of waste foodstuffs, containers, packaging and wrappings, bottles and glass, and other typical domestic wastes;

(b) ship maintenance and consist of rags and cleaning materials, oily rags, chemical agents, paint and removers, scrapings, workshop refuse, rope and cloths, exchanged components, and many other materials;

(c) the cargo in the hold and consists of packaging and wrapping materials, dunnage, tarpaulins, lashings of wire, rope and banding, and occasionally the cargo itself as a consequence of being washed overboard in heavy weather; and

(d) fishing and fishing gear wastes and losses.

11. All these materials are normally thrown over the side of the vessel except when in port or other areas where such practice is prohibited by local authorities. It is estimated that a general cargo vessel with 35 crew over a voyage of 15 days will generate 1,050 Kg (2,310 lbs.) of domestic garbage with a volume of 4.53 cubic meters (160 cubic feet). Cruise, ferry and passenger ships generate huge volumes of garbage. The cruise ship "Sovereign of the Seas" is estimated to generate 6,800 Kg (15,000 lbs.) or 44.2 cubic meters (1,560 cubic feet) of garbage per day. The more modern vessels are equipped with compactors and some with incinerators. Under MARPOL the residues from the incinerator is considered to be of the same category as plastics and must be retained on board. Almost no cruise ships have the capacity to store and carry large quantities of garbage.

12. **Sewage:** All vessels of all types and size generate sewage. Traditionally, sewage is comminuted and discharged directly to the sea, except when import or other restrictions prohibit such practices. Almost all vessels are equipped with holding tanks with sufficient capacity to enable the vessel to retain its sewage aboard while in port. After sailing, and as soon as the vessel reaches open water, the holding tank is discharged into the sea. Cruise, ferry and large passenger vessels generate very large volumes and the more modern vessels are equipped with treatment plants producing satisfactory chlorinated effluents. Very few ships are currently equipped with pumps to pump their sewage ashore but when MARPOL 73/78 Annex IV becomes effective all new ships must be fitted with pumps to be able to transfer their sewage ashore. Because of many national regulations concerning small craft and yachts, these vessels are normally equipped with holding tanks and pump ashore systems. Although MARPOL 73/78 Annex IV, Sewage, is not yet in force because of the scarcity of shore reception facilities world-wide, this situation is expected to change fairly rapidly.

13. **Chemicals:** A wide range of chemicals are transported in bulk in specially designed chemical tankers. Some of these chemicals are regarded as noxious liquid substances and pose a danger to the marine environment if released into the sea. These vessels may need to clean their tanks before

shipping a new and different cargo and this has also been traditionally carried out at sea with the washings discharged into the sea. MARPOL 73/78 prohibits such discharges. A more likely problem that frequently occurs is where noxious liquid substances are being carried in tank containers, drums or other portable tanks and these are ruptured or a spill occurs during the voyage. The chemicals have to be cleaned up, stored and then discharged in the first port of call together with the used cleaning materials.

The Reception Facilities

14. Many large ports in developing countries have been receiving some garbage and some waste oils from vessels for many years. Generally, the volumes have been small and the ports have had little difficulty in disposing of the waste, although often, the manner of disposal has been less than satisfactory. The impact of MARPOL 73/78 is that countries will now have to provide adequate reception facilities in all of their ports, harbors and anchorages. The implementation will take both time and investment and a program will have to be established in terms of priority with the more important ports being equipped first. The following provides an indication of the facilities to be provided for satisfactory handling of ship generated wastes.

15. **Oily Wastes**. Receiving oily wastes from vessels requires a facility that can remove the water from the received waste and then dispose of the resulting oils. Where there is an adjacent oil refinery or oil recycling plant this is usually not a problem but where no such facilities exist disposing of oil can be very difficult. The port reception facility consists of holding tanks for oily water equipped with a skimmer, a separator that produces an effluent of an acceptable water quality, and a holding tank for the concentrated oil, plus a mobile road tanker (or self propelled barge) to transfer the oily wastes from the ship to the tank and from the concentrate tank to the refinery. Typically, for a small 8/10 berth port, the holding tank needs to be 200 cubic meters capacity, the separator capable of 10 cubic meters/hour and the concentrate tank 10 cubic meters with a total investment cost of about US$800,000. If there is no refinery the waste oil can sometimes be blended with heavy bunker fuel oil for shore or marine use.

16. Some ports may be able to contract the reception of oily wastes to a commercial oil-recycling company if there is one available. There are instances,even in the developing countries, where such a contract is a "free service" because of the volume and value of the oils received.

17. Before oil tankers can be loaded, they may need to discharge ballast water and/or slops. Ballast water facilities are expensive because of the huge volumes involved. Even so, they have often been in operation for a number of years even in lesser developed country oil terminals. With the steady growth of modern tankers with segregated ballast tanks the problem is not considered to be acute. Disposing of the resulting oils is not a problem for oil terminals since it is usually blended into bunker fuel or crude oils.

18. Oily sludge and fuel residues can be stored without treatment in a lined dedicated basin or incinerated. Refineries usually have dedicated sludge basins and may accept additional sludge from ports. This material has been extensively used in road construction in industrialized countries.

19. **Garbage**: Garbage is simpler to manage. The normal practice is to collect the garbage on each berth and to haul it to the adjacent city or municipal waste landfill site. For a small 8/10 berth port the investment in dumpsters and a single truck is expected to be about US$260,000. In many countries it is currently illegal to receive garbage and sewage from ships because of health and agricultural risks and this issue has to be resolved satisfactorily with he legislative and regulatory authorities. Some

countries may insist on simple fumigation process before the garbage can leave the port area. A serious problem exists in ports where the adjacent municipality has no proper solid waste disposal system, a very common situation. The port may be faced with having to install and operate an incinerator itself. Such a solution may be very expensive and is not considered to be an ideal solution. Recycling should be the ultimate goal, with private contractors given the responsibility to collect on-board waste at no charge, and allowed to sell recycled materials. Where such a setup is not feasible, the ship should be obliged to pay for or deliver waste to a designated reception facility. For example, in Pusan from 1995 a large central waste treatment facility, jointly financed and owned by the public and private sector and operated as an autonomous company, will serve all industry and ships.

20. **Sewage:** Sewage can be collected from the ship with a mobile vacuum tanker (or barge) and, where permissible, discharged into the municipal system, if there is one. The port may be faced with the installation of a sewage treatment plant if local authorities will not permit discharge into the municipal system or if there is no system available.

21. **Chemicals:** Most developing countries are not trading in chemicals in bulk so the receipt of chemicals is not a major problem. However, there will be occasions when a dry cargo ship wishes to discharge spilled chemicals and the port will have to receive and dispose of them in an environmentally safe manner. This problem is associated with the overall problem of developing country ports to handle hazardous cargoes when there is typically insufficient training of cargo handlers and supervisors in how to recognize, respect, handle, store and deal with this type of cargo and spills.

22. There are three major issues: The ultimate fate of the wastes received; how to recover the cost of investment and operation of the reception facilities; and how to monitor and enforce MARPOL 73/78.

The Ultimate Fate of the Wastes

23. This is the major issue. There is little point in collecting wastes from vessels if the land based system is to discharge waste to sea. The provision of port reception facilities is only the start of the task. Disposing of oily waste and plastics presents the most difficult problem but sewage can also create major problems in sensitive marine environments even when properly treated because of the high nutrient content.

24. Special hazardous wastes such as chemicals, nondegradable plastics and noxious waste resulting form ship operations and maintenance, requires specialized and costly treatment. The recent developments in Pusan is suggestive of future trends in this area. In this case city authorities and the private sector (represented by the Chamber of Commerce and Industry) have formed a joint and autonomous waste disposal and treatment facility corporation. The city and some 200 private corporations are involved as shareholders. The resultant entity established for the purpose is responsible for implementing the project, which is to be operational from April 1995, and which is scheduled to receive all industrial and ship waste (including oily waste and sewage) and use it to generate steam that will provide heat for use in the facility. In return, economies of scale and continuous operation of the incinerators will enable the introduction of more reasonable charges to be levied on ship owners for receiving their waste, than is the case at present.

Cost Recovery

25. The capital cost of the reception facilities, the training of staff and the day to day management and operation of the facilities should be recovered from the vessels using the port, harbor or anchorages. To make the system effective and reduce the risk of the ship discharging wastes at sea under cover of night or heavy weather, the waste reception facilities should be perceived by the ship operators to be a free service. Any system that charges the vessel by the cubic meter or other unit measure will deter the ship operator form bringing his entire compliment of wastes to the first port of call to save costs. There is much evidence of this practice in the US coastal waters where, in some cases, vessels are charged for waste based on volume or weight basis.

26. The recommended approach is to add the costs of providing and maintaining reception facilities to the general charges made to all vessels using the port. Many ports have a general item in their tariff and port charges usually based on grt/nrt, the length of stay, and the type of vessel (eg Cruise ship, Bulk carrier, Yacht, etc.) to which the cost of providing waste receiving services can be added. The charge is applied whether the vessel uses the facilities or not. Typically, the amortization and operating costs of basic port reception facilities will amount to about US$0.10 per ton of cargo or about US$500 per ship To this figure, additional cost to cover the cost of disposing of the wastes will need to be added. For example, municipal landfills may charge as much as US$40.00 per ton for accepting garbage. Where shore wastes are incinerated, the costs may reach US$50.00 to 60.00 per ton. These costs will vary widely depending on local circumstances and practices. In some instances ports are able to recover their costs for receiving waste oils where they can sell the waste to a local oil recycling plant.

27. To attain the desired results the options should focus on enabling the providers of the services to profit from the activity. Failing that, decision makers would need to review options which would satisfy the law and the environmental regulations at the lowest cost possible.

28. In the case of the SWDFs the "polluters pay" principle should apply. For this reason efforts need to be made to enable the facilities to break even or operate at a margin that can service the capital invested. Consumers will undoubtedly end up paying for the improved environment in the form of higher commodity prices or higher taxes. However, with increasing income, higher levels of education and living standards, willingness to pay for cleaner marine environment could be quite high. Such was the case in the North Sea Plan in Norway.

Monitoring/Enforcement

29. It will be difficult to enforce the MARPOL Convention and the more unscrupulous ship operators will tend to ignore it in order to reduce the cost of training crew, providing storage and instituting essential discipline. The US coast guard have proposed a system for the US legislation which has merit. On arrival in a US port, the port responsible agency (USCG, Marine Police, DEA, harbor master, etc) will request the ship to demonstrate the volumes of wastes that they have on board and wish to discharge. If the volumes are substantially smaller than anticipated such that the ship must have discharged part of it at sea (considering the length of voyage; number of crew; type, age and condition of the vessel; etc) a heavy fine is imposed and the vessel held at port until the fine is paid.

30. Effective implementation may require that the Port Authority ensure SWDF contractors abide by their agreements and visit every vessel assigned to collect the regular garbage. This could be facilitated by means of the ship agents in the port, who could be given the responsibility for controlling and reporting the volume of garbage collect (garbage collection auditing).

31. What are the incentives and commands/controls required to induce the arriving vessels without on-board waste treatment facilities to submit their oily waste and sludge to the SWDF? First, the vessels that have invested in equipment for internalizing disposal by burning waste on board should not be forced to submit their waste to the SWDF, or to pay additional port charges for services that they do not need. To facilitate identification of such vessels their registration upon arrival should identify them by their waste treatment capabilities.

32. For economically recyclable oily waste, the port or an authorized SWDF, could stimulate orderly discharge to an SWDF by offering to buy it, or take it for free, and pump it out of the vessel while it is being unloaded and/or loaded. This is necessary in order to avoid delays and increased handling time at quay-side of already highly congested ports. To organize for such an operation the SWDF would need specialized port tankers to operate shipside with internationally standardized pumping gear. These tankers would bring the oily waste/sludge to the treatment facility in the port operated by the SWDF, or to a temporary storage tank, before transporting it to a "hub" treatment facility. The price paid for the oily waste, or the charge for taking it for treatment (if any) would have to be set so as to make this waste collection routine attractive to the ship owner, the SWDF as well as the private contractors receiving such waste. The institutional and financial role of the government in this context would need to be established.

33. For economically non-recyclable oily waste/sludge from vessels lacking on-board burning/incineration facilities, a combination of command and controls plus financial incentives should be considered. In order to capture the non recyclable oily waste/sludge from these vessels, an information system for arriving vessels, that identifies them by their on-board ability to recycle and burn such waste, and the amounts of such waste they carry to port, should be implemented. For those that do not have the self-treatment capability, one option would be to impose a surtax/extra port charge (by way of deposit), with the bulk repaid to the ship owner (via his port agent) once the oily waste/sludge has been discharged as prescribed to the SWDF.

34. For operational reasons, it may be more practical and cost-effective to charge all vessels with a waste handling tariff (calculated as a function of the estimated waste generated and accumulated on board for the trip in question, e.g. based on IMO-guidelines, or the formulae derived statistically in the survey analysis undertaken by KMTRI). Once the discharge is completed and confirmed the ship owner could be refunded with the amount in excess of the operating and capital expenditures of the SWDF. The amount paid (and returned) must be sufficiently large to encourage ship owners to use the SWDF. On the other hand, if there is proper enforcement, the deposit need not be large. To further encourage the use of the SWDF, the receipt of an official manifest indicating that the waste has been satisfactorily removed for storage and subsequent treatment (as is presently practiced by the authorized treatment facility in Ulsan), could be made a pre-condition for departure, where delays caused by non-performance would result not only in lost revenue/days at sea, but also additional and heavy port penalty charges.

35. If it is found that such a deposit is practical, it would seem rational to manage these payments through the ships agents in the port. In one way or another, the cost of constructing a SWDF, and the operation and maintenance costs will eventually be borne by the public. If the costs are passed on to the vessels in the form of additional port charges, freight rates will undoubtedly increase. If the costs are paid by the Korean Port Authorities while the vessels are allowed to discharge the waste to the SWDF at no cost, the Korean consumer will pay in the form of higher taxes. In return for these payments the Korean public will receive a less polluted marine environment, reduced risks of health damage, as well as reduced losses in seafood, fisheries and tourism revenues. In the case of recycling, the country may experience the development of a small but cost-effective energy substitute market that could reduce energy imports.

KOREA

PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Environmental Training Program for KMPA

A. Background

1. Experience has shown that unless adequate preventive and conservation measures are in place, ports/harbors and similar maritime developments may be faced with serious environmental problems of local or regional nature. These problems may include accelerated erosion or accretion; discharge of industrial wastes and runoffs from factories and plants; loss of animal, plant or marine species or natural habitats; contamination of fisheries from uncontrolled runoff or waste disposal; pollution from ship spills or discharges; disposal of polluted dredged materials; health and safety hazards; salt water intrusions etc. Past experience has demonstrated the need for early attention to sound management of port and harbor development projects and systematic attention to their operation to minimize their impacts on the environment.

2. The Korea Maritime and Port Administration (KMPA) is the public sector agency responsible for the planning, construction and operation of Korea's 48 commercial and coastal ports. Traditionally, KMPA has focused primarily on development planning, engineering and operational issues, but with the recent emphasis on maintaining Korea's environment, KMPA must begin to develop a better understanding of the environmental issues confronting the port sector and improve its capability to manage and minimize the negative environmental impacts due to ports development and operation.

3. The majority of KMPA's management and technical staff have limited knowledge of the environmental issues affecting the maritime sector. In order to begin addressing the environmental issues confronting the port and shipping sectors, KMPA has decided to introduce a series of training programs to upgrade the knowledge of the managers, engineers and port operating personnel in KMPA and KCTA, to make them more aware of the environmental implications of port planning, construction and operation. The program will consist of a basic training program (2 days) for all KMPA, KCTA and KMI staff and a series of specialized programs for selected professional staff. The specialized program will consist of a 2-4 week training course in Environmental Management or Administration offered by the Environmental Education Institute (EEI) under MOE, followed by 2 weeks of in-house technical environmental training focusing on the environmental issues specific to KMPA's operation. This training will be combined with 2-4 month overseas visits and training at selected ports (possibly under twinning arrangements) or institutions. Following the completion of the training program, selected participants will be offered opportunities to pursue extended studies in environmental science or environmental engineering.

B. Key Environmental Issues and Requirements

4. **Issues**: The key issues pertaining to the management of the environment in port development and operation can be divided into three broad categories: a) management and regulatory issues; b) planning and construction; and c) operation and maintenance. The main topics in these issues are presented below:

(a) management and regulatory issues

* national and local environmental regulations;

* port, harbor, coast guard and other relevant regulations;

* local municipal regulations (planning, zoning etc.);

* fire, health and safety regulations (including emergency response and contingency planning);

* IMO and other international conventions and regulations pertaining to marine pollution and ecosystems, transport of hazardous cargos and wastes, ship wastes and ocean dumping conventions, management of dredged materials etc; and

* on going management commitment including allocation of adequate operating resources, public relations (including public participation, dealing with NGOs etc.), environmental impact assessment, personnel, training etc.

(b) planning and construction

* acquisition of private and/or government land, displacement of people, houses, and businesses, compensation and resettlement issues etc.;

* encroachment of protected/sensitive ecological and conservation areas;

* impact on the environment and amenities including air, noise, vibration, traffic, safety, water quality, housing, labor etc.;

* impact of reclamation including excavation for fill, dredging, dredged material disposal, construction of piers, breakwaters and other structures; and

* development of an environmental impact assessment (EIA) report including development of TORs, hiring of consultants, management of studies, liaison with regulatory and other agencies, public participation, management review etc.

(c) operation and maintenance

* operation and maintenance monitoring programs, including monitoring for air and water quality, marine environment, solid and hazardous wastes disposal, noise, on-shore receiving and treatment facilities, environmental indices etc.;

* emergency response and marine spills contingency plans;

* environmental health and safety training programs;

* coordination with management and other KMPA departments, MOE, coast guard, customs, local authorities, fire department, port security, civic organizations, stake holders and other relevant organizations; and

* preparation of environmental reports.

5. **Requirements**: To deal with these issues effectively, it is important that KMPA, including KCTA and KMI, should have the capability to:

* understand the environmental issues and incorporate them into the planning and preparation stages with due consideration to minimizing the adverse environmental effects and with adequate allocation of budget to ensure effective implementation of the mitigation measures;

* direct and coordinate the engineering and environmental work to be conducted by consultants including the preparation of TORs and management of contracts;

* acquire adequate knowledge and experience in environmental monitoring including the selection and acquisition of monitoring equipment, data gathering, data reporting etc; and

* maintain close coordination with other concerned agencies, especially MOE, and the public and/or the affected groups.

C. Implementation

6. Given the limited knowledge and experience of environmental matters in KMPA, it is envisaged that consultants will be hired to develop the training material and carry out the basic and specialized training except for the courses provided by MOE. The consultant will also design detailed TORs for an overseas training program (either through direct or twinning arrangements with ports/port authorities) in developed countries to enable selected KMPA, KCTA and KMI staff to gain port and maritime related environmental experience. KMPA intends not to duplicate the current training program being offered by the MOE but to supplement the MOE training with port and maritime specific environmental training.

7. In order to ensure effective implementation and participation in the training program, KMPA management should make it clear that: (i) each KMPA staff member has a role and responsibility towards the environmental well-being of the maritime sector; (ii) it is the responsibility of the all divisions/offices to ensure full integration of environmental concerns into all aspects and stages of the project development cycle including project construction, supervision, operation, maintenance and monitoring; and (iii) each concerned division/office is responsible for environmental coordination and cooperation within and outside KMPA. At present, there no single unit within KMPA responsible for the environment. Therefore, it is envisaged that at the initial stage, the Port Development Division (PDD)of the Port Construction and Development Bureau will be responsible for development, coordination and implementation of the training program. Later on, when alternative arrangements are made, such as, the establishment of an Environmental Unit in KMPA, this responsibility can be transferred to the new unit. When established, this unit should play a major role in the coordination of the environmentally related activities inside and outside KMPA with strong support from the regional offices and KMI.

D. Proposed Training Program

8. **Objectives:** The primary objective is to increase the environmental awareness, understanding and knowledge of the KMPA management and technical staff, including the district offices, KCTA and KMI, of the key environmental issues including health and safety, related to the development, construction and operation of port facilities and maritime activities. The second objective is to establish an effective group of trained staff in KMPA knowledgeable about the technical environmental issues facing KMPA and capable of dealing with them on a day-to-day basis. With this training, KMPA staff generally will be better able to understand and identify potential problems and to work with the environmental experts in the MOE, independent consultants, government officials, and the public.

9. **Training:** The training program is designed to suit the short- and long-term needs of KMPA and the training activities include both general and specific training in-country by local and international experts; meetings/seminars/workshops; specific training abroad through secondment/exchange program; and study tours. The technical program would cover EIA methodology, environmental management, pollution control including marine pollution, dredging, dredged material disposal, emergency response, monitoring, reporting etc. An in-country cooperative program would be established with MOE to avoid duplication. A cooperative training/exchange program would also be established with appropriate institutions (possibly through twinning arrangements) in developed countries for exchange of knowledge and experience on environmental issues related to port and maritime activities and their environmental costs/benefits.

10. The training program would consist of the following key elements over a period of three years:

(a) **Basic Training:** The purpose of this training is to: a) provide general knowledge and understanding of the broader environmental issues facing KMPA in its development and management of ports and maritime activities; b)increase the awareness and knowledge of the KMPA staff about the trends in international, national and local environmental protection policies, legislation, directives, enforcement, penalties etc.; c) discuss the role of MOE; d) discuss the relevant International Conventions and Agreements in the management of marine environment; and e) focus on the policies and directives of KMPA and how they reflect in the overall environmental management, the development of EIAs, the role of NGOs, public participation, etc. The training will also cover broad environment issues affecting port and harbor development, construction, operation, monitoring, reporting etc. The program will be presented in two day classes and will be mandatory to all KMPA, KCTA and KMI staff and the management.

(b) **Technical Environmental Training:** The purpose of the technical training is to increase the technical environmental knowledge and expertise of selected KMPA staff and engineers responsible for the planning, design, construction, and operation of ports and other marine projects. The training would be divided into three parts: a) local training by MOE (2-4 weeks) followed by in-house training by local consultants (2 weeks) to tie-in the generic training by the MOE to the more KMPA and port specific issues; b) 2-4 months overseas training and visits at selected ports or institutions; and c) for the selected participants extended studies program in environmental sciences or environmental engineering. The main elements of the technical training would include:

(i) Environmental issues in planning and construction including an overview of socio-economic impacts of land acquisition and resettlement, protection of marine and ecological areas, types of pollution and their impact on the environment, impact of dredging and reclamation, and methods and techniques available to minimize negative impacts and maximize positive benefits;

(ii) Operation and maintenance monitoring programs including data management, reporting, mitigative measures etc;

(iii) Main elements of emergency response and marine spill contingency plans;

(iv) Overview of EIA methodology and contents specific to port and marine projects; importance of the public hearing process, public and NGOs participation etc;

(v) Coordination of environmental programs and issues within KMPA, and outside KMPA with MOE, coast guard, customs, local authorities, fire departments, port security, civic organizations, stake holders and other concerned organizations;

(vi) Supervision of construction and maintenance work program to ensure environmental compliance; and

(vii) Preparation of reports for internal and external uses.

Basic Training: To all KMPA staff
1 course per month
Duration: 2 days
Participants: 50-60 per course

Specialized Training: For selected professional staff
1 course per year
Participants: 12 per year
Pre requisite: Basic course

a) MOE Course: Duration: 2-4 wk
Follow up in-house course: 2 wk

b) Overseas Training/Visits:
Duration: 2-4 months
Pre-requisite: Basic + (a)

c) Extended Studies:
Duration: 1 year
Participants: 2 per year
Pre requisite: Basic + (a) + (b)

E. Proposed Schedule

Activities/year	94	95	96	97	98	99
* Prepare training programs	----------					
* Implement in-country training						
Basic Training		----------3 year----------				
MOE Training			----------			
Follow up Training		----------				
*Implement training abroad		-----3 year----------				
Short-term training/visits		----------				
Extended studies			----------			

Attachment

Terms of Reference for the Environmental Training Program

A. Introduction

1. The Korea Maritime and Port Administration (KMPA) is the public sector agency responsible for the planning, construction and operation of Korea's 48 commercial and coastal ports. With the recent emphasis on maintaining Korea's environment, KMPA plans to develop a better understanding of the environmental issues confronting the port sector and improve its capability to manage and minimize the negative environmental impacts due to ports development and operation.

2. To begin addressing the environmental issues confronting the port and shipping sectors, KMPA has decided to develop and implement a series of training programs to upgrade the environmental knowledge of the managers, engineers and port operating personnel in KMPA and KCTA, and to make them more aware of the environmental implications of port planning, construction and operation in their day-to-day activities. KMPA envisages a training program consisting of a: (i) basic training program for all KMPA, KCTA and KMI staff; and (ii) series of specialized programs for selected professional staff.

B. Proposed Training Program

3. **Objectives**: The primary objective of the training program is to increase the awareness, understanding and knowledge of the KMPA management and technical staff, including staff in district offices, KCTA and KMI, of the key environmental and health and safety issues related to the development, construction and operation of port facilities and maritime activities. The second objective is to establish an effective group of trained staff in KMPA knowledgeable about the technical aspects of environmental issues facing KMPA and capable of dealing with them on a day-to-day basis. With this training, it is envisaged that KMPA staff generally will be better able to understand and identify potential environmental issues and problems and will be better able to deal with the environmental experts in the MOE, independent consultants, government officials, and the public.

4. **Training Program:** The training program should be designed to suit the short-term and long-term needs of KMPA and the training activities should include both general and specific training in-country by local and international experts; through meetings/seminars/workshops; and by providing specific training abroad through secondment/exchange program; and study tours.

5. The training program should consist of the following:

(i) **Basic Training:** The basic training should : a) provide a general overview and understanding of the broader environmental issues facing KMPA in its development and management of ports and maritime activities; b) increase the awareness and understanding of the KMPA staff about the trends in international, national and local environmental protection policies, legislation, directives, enforcement, penalties etc.; c) discuss the role of MOE in the context of KMPA's operation; d) discuss the relevant National and International Conventions and Agreements in the management of marine environment and their relevance to KMPA; and e) discuss the policies and directives of KMPA and how they reflect in the overall management of environment in KMPA's operations, the development of EIAs, the role of NGOs, public participation, personnel, training etc. The

training will also cover broad environmental issues affecting port and harbor development, construction, operation, monitoring, reporting etc.

The program should be presented in two day classes and is to be mandatory to all KMPA, KCTA and KMI staff, district office staff and the management.

(ii) **Technical Environmental Training:** The purpose of the technical training is to increase the technical environmental knowledge and expertise of selected KMPA staff and engineers responsible for the planning, design, construction, and operation of ports and other maritime facilities. The technical training should be divided into four parts: a) 2-4 weeks of local training by the Environmental Education Institute (EEI) under MOE; followed by b) 2 weeks of in-house training by local consultants to tie in the generic training by EEI to KMPA and port specific issues; c) 2-4 months of overseas training and visits through a training arrangement at selected ports or institutions; and d) for the selected participants, an extended studies program in environmental sciences or environmental engineering.

C. Scope of Work

6. The selected consultant, in consultation with KMPA, will be required to: a) develop in-house training programs; b) where appropriate, deliver the in-house training; c) select meetings, seminars and workshops to be attended by those participants receiving technical environmental training; d) select and make appropriate arrangements with overseas institutions, ports etc. which are willing to provide environmental training to KMPA staff; e) select overseas institutions of higher learning which offer courses in environmental sciences and environmental engineering which would be appropriate for KMPA staff to attend; and f) assist and advise KMPA on environmental training related matters.

7. In particular, the selected consultant will:

(i) develop a detailed outline of the two day in-house **basic training** program, bearing in mind that the audience for the training will consist of all KMPA, staff with wide educational and technical background;

(ii) agree with KMPA about the contents of the course;

(iii) develop a detailed schedule to implement the basic training program;

(iv) develop course material, training manuals, audio/visual aids, quizzes, etc.

(v) implement the training program;

(vi) based on the feedback from participants and KMPA, amend the basic training program as appropriate;

(vii) for **technical environmental training** and for selected participants, assist KMPA to select appropriate EEI training courses and make arrangements for the participants to attend the courses;

(viii) develop a two week in-house training program including training manuals, audio/visual aids, course materials, quizzes, test materials, site visit programs etc. as a follow up training to tie in the EEI training to KMPA and port specific issues;

(ix) select and recommend to KMPA meetings, seminars, workshops etc. relevant to port and maritime environment and suitable for the participants to attend as part of their training program;

(x) in consultation with KMPA, contact overseas institutions, port authorities etc. who may be willing to participate KMPA and provide environmental training to KMPA personnel for a period of 2-4 months - consideration should be given to developing a twinning arrangement; and make appropriate arrangements for the selected staff (who have completed the basic and EEI/in-house training courses successfully) to attend the training;

(xi) in consultation with KMPA, recommend institutions of higher learning which offer courses in environmental engineering and sciences which could be of benefit to the participants and KMPA in their long term strategy to develop an environmental expertise within KMPA; and

(xii) assist and advise KMPA on training related matters and prepare a yearly report on the status of the training program.

D. Duration of the Assignment

8. The proposed training program is expected to last for a period of 3-4 years.

9. The basic program will be mandatory to all KMPA staff. It is anticipated that this program will be offered to all KMPA, KCTA, KMI, and district staff and the management. The course is to be offered on a monthly basis to 50-60 participants per month.

10. The technical environmental program will be offered to approximately 12 selected staff members per year. Those staff members who successfully complete the basic training plus EEI and the follow up in-house training can participate in the overseas training/visits (2-4 months duration).

11. From the selected participants, two participants per year will be chosen to undertake a longer extended study course in environmental sciences or environmental engineering at overseas institutes of higher education.

E. Proposal

12. Consultants are invited to submit proposals to KMPA outlining their interest, experience, and expertise in providing the proposed services. The proposal should include a schedule showing the development of the training programs, delivery of programs, CVs and experience of experts preparing and delivering the programs, schedule of fees broken down to show the initial preparation, revision and delivery costs by year, and overall schedule.

F. Background Information

13. A background document titled "Environmental Training Program for KMPA" is attached for information.

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PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Outline of Semi-Annual Progress Reports

1. The purpose of these reports is to provide information on significant events which occurred during the reporting period, together with an evaluation of progress achieved and the prospects of future progress. To this end,the information contained in the reports should cover at least the following aspects of the project:

(a) physical work accomplished during the reporting period;

(b) a comparison of the actual progress of construction at the end of the reporting period with the original forecast of progress at that date;

(c) actual or contemplated material deviations from the original plans or schedules, except that any such changes which would require prior consultation with the Bank should be reported immediately and subsequently included in the next report;

(d) other changes, events or conditions which would materially delay the construction of the project or increase its cost; and

(e) the expected dates of completion of the principal physical elements of the project.

Civil Works

2. Construction progress should be reported on all the main items of this component of the project as follows:

2.1 Preparatory work

2.2 Main items of works

- wharf and causeways
- reclamation
- pavement
- utilities
- power supply
- telecommunications
- roadways

2.3 Supervision of construction

2.4 Consultant's activities and effectiveness

Equipment

3. Progress on procurement of the port and cargo handling equipment should be mentioned with particular reference to the:

- bidding process
- manufacturing/supply
- testing and operation

Technical Assistance

4. Information contained in the reports relating to the studies undertaken in the project should include the following information on the Yellow Sea Program of the feasibility study and detail engineering for the ship waste disposal facilities, the vessel traffic management study, and environmental training:

- the selection of consultants
- the work of the consultants and their effectiveness
- the current status of the study

Traffic

5. Particulars of port traffic that is actually handled during the reporting period, desegregated by commodity so that the appraisal estimates and forecasts can be checked and updated, should be included in the report.

Text of the Report

6. The text of the report should describe the work performed on each major item during the reporting period, following the heading given above. Where appropriate, the text should include explanations of and comments on the following:

(a) Actual or expected material deviations from the original (or amended) plan/design or implementation schedule.

(b) Actual or expected difficulties or delays, any measures taken or planned to correct them, and the probable effects on the implementation schedule.

(c) Expected changes in the completion date of any major part of the project or the project as a whole.

(d) Actual or expected delays in delivery of major items of equipment. Reasons for such delays should be given, and their possible effects on the implementation schedule should be estimated.

(e) Numbers in the work force of the consultants and contractors.

(f) Any actual or expected event or condition which may effect the cost of the project.

(g) Any unusual occurrences affecting the progress of the project.

(h) Project expenditures and disbursements and a comparison of actuals with estimates and reasons for the deviation, if any.

Drawings

7. Drawings showing the plan and sections of the breakwater should be included. Construction progress should be indicated on the drawings by color or other markings.

Implementation Schedule

8. A bar chart should show separately scheduled and actual progress on principal activities of each project component. Simplified CPM or PERT diagrams, which may present a more comprehensive picture of the schedule and progress than the chart, may be used if necessary.

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Supervision Mission Plan

Timing	Main Activities	Skills Required	Staff Weeks
9/94 (a)	Initial Review (i) steps taken to comply with requirements for loan effectiveness; (ii) preparation for bidding of works and equipment; (iii) selection of consultants to undertake studies; (iv) status of private sector participation; (v) local supervision team arrangements; (vi) arrangements for environmental monitoring; (vii) status of Yellow Sea LME	Project Management Port Engineering/Operation Environmentalist Marine Biologist Procurement Disbursements	5
(b)	Project Launch Workshop: Review of all key procedures for Bank-executing agencies interactions, procurement, disbursement, compliance with loan/loan covenants, implementation schedule, updating cost estimates and progress reporting requirements.		
2/95	General Supervision: (i) review overall progress of each component identify issues and agree on follow up action; (ii) review and reach agreement on arrangements for training.	Project Management	3
9/95	Major Supervision: In depth review of implementation status with emphasis on: (i) contractor's performance; (ii) adequacy of environmental protection measures; (iii) consultant's conduct of studies; (iv) operating and financial performance of KCTA; (v) Yellow Sea LME	Project Management Port Engineering/Operation Environmentalist Marine Biologist	4

2/96	General Supervision (i) review overall progress of each component, identify issues and agree on follow-up action; (ii) review progress of studies	Project Management	2
9/96	Major Supervision: In depth review of implementation status with emphasis on: (i) environmental impact assessment on wild life; (ii) contractors performance; (iii) project cost update; (iv) follow up action on recommendations of studies; (v) outcome of training programs; (vi) Yellow Sea LME	Project Management Port Engineering/Operation Environmentalist Marine Biologist	4
2/97	General Supervision: Review overall progress of each component, identify issues and agree on follow-up action.	Project Management Port Engineer/Operation	2
9/97	Major Supervision: In-depth review of implementation status with emphasis on: (i) waste disposal facilities, VTMS, Yellow Sea LME (ii) adequacy of inland transport connections; (iii) determination of operating procedures (iv) arrangements for setting up operations relating to cargo handling:- customs, freight forwarding, etc. (v) state of preparedness of private sector interests; (vi) contractor's performance.	Project Management Port Operation Environmentalist Marine Biologist	4
2/98	General Supervision: Review overall progress of each project component and initiate preparation for operation of Dadaepo timber terminal and Kwangyang container terminals.	Project Management	2

9/98	Major Supervision: In-depth review of implementation status with emphasis on: (i) contractor's performance; (ii) procurement of equipment for cargo handling; (iii) environmental improvement measures; (iv) follow-up action on recommendations of studies; (v) adequacy of training (vi) final review of Yellow Sea LME	Project Management Port Engineering/Operation Environmentalist Marine Biologist	5
2/99	General Supervision: Review overall progress of each component, identify issues and agree on follow up action.	Project Management	1
9/99	Major Supervision: In depth review of implementation status with emphasis on: (i) contractor's performance; (ii) arrangements relating to private sector participation; (iii) state of preparation for commencement of operation of new facilities; (iv) state of preparedness of port-related agencies; (v) operating and financial performance of KCTA; (vi) preparation for PCR.	Project Management Port Operation	3
2/2000	PCR Mission	Project Management	2

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PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Project Monitoring Indicators

1. Monitoring of project progress will be the responsibility of all units concerned with the execution of the project. Monitoring will be summarized by the Director of the Port Development Division in KMPA for those project components involving KMPA. Monitoring will be prepared for the Pusan Phase IV component by the Vice President for Planning for KCTA. Project progress for the KMPA components will be monitored using a Computerized Project Management System which will provide outputs on the financial and physical status of each of the components. Each main area of development under the project will be monitored on a continuous basis and reviewed with the Government by the project review missions.

2. In particular, progress of the following items will be included:

Construction of the Port cum Industrial Complex at Dadaepo

(a) The ability of the special corporation created to construct the complex to raise sufficient capital to start construction.

(b) The average property values in the areas from which the timber and fish processing plants will relocate to Dadaepo will rise to be equal to the average property values in comparable areas in Pusan.

(c) The PCG amends the current zoning for the areas from which the plants relocate to specify that only residential and commercial property may locate in the vacated land.

Design and Implementation of the Ship Waste Disposal Facilities

(a) Agreement on the "hub" ports to collect and dispose of the wastes generated by fishing and coastal vessels.

(b) Agreement on the institutional aspects of the project and the most efficient means to recover the cost of the facilities.

Construction of the Pusan Phase IV Container Terminal

(a) Construction of the inland container depot in Yangsan starts in the second half of 1994.

(b) With the completion of the ICD and the Phase IV terminal, the 34 off-dock container yards will relocate from their existing locations in residential areas of Pusan to those newly constructed facilities.

(c) The PCG amends the current zoning for the areas from which the plants relocate to specify that the vacated land may only be used for residential and commercial purposes.

Training and Technical Assistance

(a) The environmental training component for the staff of KMPA, KCTA and KMI is developed, and a scheduled prepared to ensure that the entire staff will receive the basis program during the life of the project.

(b) The Bank staff are able to maintain a regular dialogue with the staff of KMPA with respect to the privatization of the multi-purpose terminals, the improved management of the leased facilities, and strengthening the environmental capability of KMPA and KCTA.

General

(a) The projected traffic volumes for containers as well as fish and timber will be monitored annually along with the financial results for both KMPA and KCTA (see tables 10, 11, 13, 18-25).

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PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Land Acquisition, Compensation & Relocation Practices

1. Korean resettlement practice is based on the need to alleviate the economic and social consequences of compulsory acquisition of land and assets. Fair and prompt compensation for losses suffered underlie Korean law and practice. Displaced persons are assisted to regain their former living standards, and income or production levels. Generally, their approach meets the requirements of the Bank's policy as set forth in OD 4.30. However, this practice is inconsistent with the Bank's policy as it does not provide for: (a) compensation for the lost assets at replacement cost; (b) compensation to non-holders of legal titles; and (c) compensation to workers.

2. Land Acquisition. Acquisition proceedings by public agencies including provincial governments, are governed by the "Special Law on Acquisition and Compensation of Lands for Public Use", which has been in force since December 31, 1975. Mandatory land purchase for development projects is covered by this law and is initiated by a public notice of the proposed land acquisition. Under the law, the responsible project agency makes the initial surveys and investigations, prepares a preliminary valuation of compensation payable for property, loss of livelihood, relocation expenses, etc and forwards these estimates to the project implementation office for verification and discussion with the affected persons. This normally occurs about six months in advance of finalization of the acquisition proceedings, and is part of development plans that detail the relocation needs and compensation aspects.

3. Almost simultaneously, the project agency refers these initial surveys to two private valuers, who are licensed under the law to make independent valuations of compensation payable to the affected persons. These independent valuations are made in accordance with guidelines framed under the law and are based on the valuer's professional judgement after taking both market prices and book values into consideration. The average published valuation of the two independent valuers' assessments form the basis for final negotiations with the affected persons. Where no agreement is reached, the Ministry concerned or the project agency must negotiate the purchase price with the landowners. In the event these negotiations fail, the affected parties are entitled to make an appeal to a Land Expropriation Appeals Committee, which is set up under the Law by the concerned City or Province or the Ministry of Construction as the case may be, to hear and adjudicate such cases between the parties and determine compensation.

4. Past experience indicates that about 10% of affected persons make an appeal to this Committee mainly to get a reassessment of property values based on anticipated appreciation resulting from the proposed improvements for which the land is being acquired. In the event that the Committee's findings are unacceptable to the parties concerned, recourse is always available to the Courts under the general laws. These proceedings normally take from 6-9 months.

5. Compensation. As stated earlier, compensation is determined by independent professional valuations based on market prices and book values. Compensation is payable for both affected movable and immovable property as well as for loss of crops and other assets, loss of livelihood (on average up to three months of estimated foregone earnings), loss of house rental deposits of displaced tenants, and relocation expenses. Relocation could be offered in a resettlement complex. Compensation was paid in cash until 1993 but now an election could be made to be paid in government securities, which offer some capital gains and tax concessions to land owners. Assistance is also generally provided to disadvantaged families to relocate, find suitable accommodation, schooling and health facilities. Poorer families are subsidized for the hardship caused by the relocation. Compensation is also payable to tenants who have lived in the affected house for at least three months.

6. Relocation. The Special Law on Acquisition and Compensation of Lands referred to earlier contains specific provisions on resettlement. In addition to compensation, where more than ten households are affected at one site, the project agency is expected to provide housing at a resettlement site, including basic infrastructure, such as roads, water and sanitation. The criteria for eligibility under the law is residence on the site to be acquired on the date of approval of the development plan for the project. The Korean system of residency registration makes verification of eligibility easy. Owner occupiers have the option to purchase a new plot of land at a discounted price or a price controlled apartment on a priority basis. Provincial governments usually give first priority to displaced persons in the allocation of units in public housing programs. Finally, project design aims to avoid or minimize resettlement.

7. Institutional Arrangements. To expedite the adjudication of cases in dispute, the law established a Central Land Expropriation Committee in the Ministry of Construction and Local Land Expropriation Committees in the major cities and in each Province. These committees have provided an established institutional mechanism for dealing with land acquisition since 1975, also broadening the scope of the policy for dealing with involuntary resettlement in the process. The Central Land Expropriation Committee, which is the highest policy making and appellate body, is chaired by the Ministry of Construction and includes judges, lawyers, professors of law and high ranking public servants. The Ministry of Construction is, therefore, charged with the main responsibility for implementing the land acquisition policy, which in practice is delegated to the appropriate enterprise, provincial or city authority level.

Dadaepo Project Component Compensation Program

8. Under the project, very few house and land owners are affected. KMPA has minimized the amount of involuntary resettlement through the design of the complex and the location of the roads. In total, resettlement/compensation is required for three houses which serve as both dwellings and small beach-side restaurants, three mariculture farms raising seafood and covering an area of 650 ha, and eight other vacant lots totaling about 90,000 sq.m. These owners will be offered about W15 billion in total compensation and the owners of the three homes will be allowed to relocate to the reclaimed beach. The estimated compensation was computed at a 40% premium over comparative October 1993 market prices.

9. Compensation for the loss of business rights for the three restaurants, three mariculture farms, fishermen holding licenses to fish in the site affected by the project, and the twenty-five restaurants

discussed in paragraph 10 will be offered about W13 billion, depending on whether they are directly or indirectly affected by the breakwater construction and sea reclamation. Those directly affected will be offered compensation computed to cover earnings over an 8 year period, while those indirectly affected will be partially compensated at 30% of earnings over a 2.5 year period. Owners of ten fishing boats operating in the project area without license are not deemed to have fishery rights, and in accordance with legislation enacted in August 1990, will not be compensated. However, they may obtain a license to fish elsewhere.

10. There are an additional twenty-five shops/buildings (primarily seafood restaurants) located in the project area. The owners will be offered the opportunity to participate in the project. The existing buildings will be taken down and the land reclaimed to a level equal to that of the adjacent industrial complex. The cost to reclaim the land will be the responsibility of the current owners who will continue to own the land. After construction of the complex and the introduction of better utilities to the area, it is expected that the value of the land would increase above its current estimated value (plus reclamation costs). The property owners will also have the choice to sell their land to the complex developer or to other businessmen. Negotiations for this land will be started as soon as the legislation granting authorization to the private operators to reclaim the land as a public purpose project has been approved by the National Assembly. Draft legislation has been presented to the National Assembly, and it is anticipated that it will be passed in mid 1994. Final agreements with these land owners may not be finalized until early 1995.

Past Bank Experience in Korea With Resettlement

11. No major problems have been encountered in earlier Bank assisted projects. In the completed Chungju multipurpose project, US$172 million was spent compensating 9,300 families, 7,100 of whom were actually resettled, at a per family cost of over US$18,000. In the Taegu Urban Transport Project, the provincial authorities compensated and relocated some 2,370 families. In a recent study, OED has evaluated the resettlement outcome of the Chungju project and the First Water Supply Project as satisfactory.

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PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Environmental Impact Assessments (EIA)

A. EIA Requirements

1. In Korea, the Basic Environmental Policy Law (BEPA) requires that an environmental impact assessment (EIA) be prepared prior to the construction of port facilities and industrial complexes. The EIA guidelines, issued by the Ministry of Environment (MOE), require, among other things, public consultation prior to approval of such projects by MOE. Public announcement is made through newspapers and public notices and the EIA report is exhibited for public review and comment for 20 days. Results of the consultation are considered during the preparation of the final report and the comments and opinions of individuals and concerned agencies are documented in the report. The implementing agency is responsible for the preparation of the EIA and for the implementation of the mitigation measures and monitoring program. MOE is responsible for the review and approval of the EIA and the periodic monitoring of its compliance. The penalty for noncompliance may result in imprisonment for one year or a fine of up to W5 million. In December 1993, the BEPA was revised and public hearings are now required upon request by the residents. The EIA process and guidelines used in Korea have been reviewed and found to be satisfactory.

2. The project comprises five components: (i) ship waste disposal facilities (SWDF); (ii) vessel traffic management systems (VTMS); (iii) construction of a port and industrial complex at Dadaepo (Dadaepo component); (iv) construction of a container terminal in Pusan Port (Pusan Phase IV component); and (v) technical assistance and training. The Dadaepo and Pusan Phase IV components are the only project components that require the preparation of an EIA. The English summaries of the reports were prepared and sent to the Bank separately. During appraisal in March 1994, the final EIA reports, the actions that have been and/or will be taken to deal with the environmental issues, and other related information were reviewed and the results are presented below.

B. EIA for Dadaepo Component

3. Description A new port capable of serving 5,000-50,000 DWT ships and an industrial complex would be built in a cove at Dadaepo Bay. The total land area would be about 1,687,000 m2 of which 96% would be reclaimed up to the level of about 3.26 m above mean sea level. The main port facilities include two breakwaters (900 m and 180 m), a 500 m seawall, a 1,940 m quay, and a ship channel of 300 m wide and 11.5-14.5 m deep. Kuen Sol mountain and a small island which are located in the proposed site, would be demolished and used as landfill. About 900,000 m3 of bottom sediment would be dredged and disposed of at sea in an area approved by MOE. The sediment has weak characteristics and is not suitable for use in reclamation. A 2,160 m long seawall would be built along

the boundary of the Nakdong River preservation area to prevent damage to the area. About 950,000 m3 of rocks, 1.65 million m3 of soil, and 9.05 million m3 of sea sand would be required for construction. The rock and soil would be obtained from the demolition of Kuen Sol mountain and the near by island. The remaining material would be acquired and transported by trucks from the nearby quarry sites. The sea sand would be acquired from the area offshore of the Nakdong river mouth about 3 km from the proposed site. After completion of the construction, the industrial complex would be developed. Of the total area, about 65% would be allocated for timber processing factories and storage yard, 22% for marine-product processing factories, 8% for Hanjin heavy industry, and 5% for green areas and other public facilities. An access road will be built at the site to provide direct transportation of products from the port and industrial complex to the existing road network.

4. Analysis of Alternative Sites The Dadaepo area has been designated for the development of an industrial complex for many years, and the initial feasibility studies determined that the least cost solution would be to construct the port and a large portion of the industrial complex on reclaimed land in the Nakdong River. The primary reason for this decision was due to the shallow water depth in the river as opposed to the deep water in Dadaepo Bay. In 1992, soon after the KMPA had decided to develop a new port in Dadaepo area, a meeting was conveyed with local officials, residents in Dadaepo area, and university researchers in Pusan. The issue discussed during the meeting was on the location of the port. Between the two proposed sites: the Nakdong River and the Dadaepo Bay, the majority of the participants indicated their preference for the river side despite the fact that it is designated as the natural preservation area. The outcome of the meeting was, however, overruled by MOE since the area is protected by law. After lengthy discussions, it was agreed that the complex would be constructed in the Bay and up to the boundary of the natural preservation area under three conditions: no encroachment of the natural preservation boundary, no port activity along the Nakdong River side, and no waste water runoff into the Nakdong River. The basic design for the component was made based on this agreement.

5. EIA study and approval. The Korea Maritime and Port Authority (KMPA) is the implementing agency for this component. The EIA study was prepared as part of the feasibility study with assistance from consultants: Daewoo Engineering Company, Woobo Engineering Company, Hanyang University, Pusan University, and the Korea Institute of Science and Technology. The EIA study was conducted from June 1992 to October 1993 and the report was prepared in accordance with MOE's guidelines. Public consultation was also conducted as required by law. The final report was prepared given due consideration to the comments received and was submitted to MOE in March 1994. Approval of the EIA for this component is anticipated in May 1994.

6. EIA review. Review of the baseline condition showed that the proposed site is located at Dadaepo in Saha district (gu) and is mostly surrounded by mountains and the sea. Industrial and residential areas are located in the northern part and a new apartment complex is being developed near the proposed site. The Nakdong preservation area is located along the west boundary. Molundae Mountain is located in the south and fisheries and seaweed cultures are common in the area. Dadaepo Bay is located on the east and is being used as a fishing port and for other industrial purposes. Measurement of environmental conditions indicate high concentrations of suspended particulates (TSP) near the proposed site and relatively high concentrations of nutrients and Pb, Zn, Cu, and Cd in water and sediment samples taken from Dadaepo Bay. No detected levels of Cr+6 in water samples and of Hg, As, and CN in sediment samples were reported.

7. The EIA study concluded that implementation of this project will benefit the city's economy and will contribute significantly to the reduction of traffic congestion and to the risk of road accidents. Negative impacts, however, are inevitable, but most of them are minor and/or can be minimized. Description of the impacts and the mitigation measures on the marine environment, including oil spills, land and marine traffic, disposal of dredged spoiled, and the proposed quarry sites were found to be inadequate. Supplementary information was requested and submitted to the Bank in early May. The EIA report, including the supplementary was again reviewed and found to be satisfactory.

8. During construction, the impacts on the quarry site for rocks and soil would be minimized under a separate EIA which is already approved by MOE for each quarry site. Demolition of the Kuen Son mountain and the island and construction of the breakwaters would be done carefully to minimize the impact due to blasting. Acquiring sea sand from the proposed area does not require an EIA approval, and it is located far away from the Nakdong preservation area. According to the standards used in the Netherlands (World Bank Technical Report No. 126), the levels of Cd, Zn, and Cu in sediment samples taken from the area to be dredged lie between the "reference level" and the "testing value" and thus open water disposal is permitted under certain conditions. The levels of Pb, however, are within the "reference value" where restriction for disposal is not required. To mitigate the impact, dredging would be controlled to minimize disturbance, and the dredged spoil would be reanalyzed for levels of heavy metals. If necessary, measures will be taken to prevent contamination of the disposal sites, and a pump dredging ship would be used to minimize the generation of SS levels. Effective silt protectors would be installed when constructing breakwaters and sea walls, dredging, and reclamation. Monitoring of SS would be done and working hours adjusted if the SS levels exceed 25 mg/l.

9. About 60 trucks per day are expected in order to transport the necessary construction materials. With completion of the new road along the Nakdong River, no serious impact is expected from this traffic. Measures will be taken to minimize the level of air and noise pollution due to traffic. In addition, the construction equipment will comply with the legal standards, and greenbelt and sound proof walls would be installed as appropriate. To deal with wastes, mobile toilets would be provided, and all waste materials would be collected and disposed of according to Pusan City waste management plans and regulations.

10. During operation, the discharge of any kind of waste into the Nakdong River would be prohibited. All waste and storm water from the complex and port facility would be collected and treated in a separate treatment plant (capacity 20,000 m3/d) to be constructed at the complex. The proposed discharge area is located in the south and no adverse impact on water quality is expected near the discharge area. The general solid waste would be collected and disposed of at the new landfill site of the city (Sang Guk Dong, Kang Seo Gu, 11.6 million m3 capacity, EIA approved). Possible impacts due to vermin and other diseases that may come with the importation of timber is unlikely since it is a normal practice that all timber be treated in the vessel before unloading. In Saha district, the water supply service was 0.16 million m3/d and a service rate is nearly 100%. About 141,500 m3/d of wastewater was generated and 280,000 m3/d was treated at Janglim STP (capacity 300,000 m3/d). High concentrations of heavy metals in Dadaepo Bay is likely to be due to the discharge and/or water runoff from the existing heavy industries located near the head of the Bay. According to the sewerage expansion plan for Janglim STP, waste water generated from this area will be collected and treated. The impacts and mitigation measures are summarized in Table A-1.

11. Consultation with the affected groups is another key issue of concern to MOE. The consultation and compensation process was reviewed and found to be satisfactory. The consultation was carried out at an early stage (during site selection) and the results were considered in the decision making process. The initial version of the EIA was made available to the public in November 1993. Written comments from 260 individuals (out of 1,500 who saw the notice) were obtained at the end of the public announcement, of which 44.5% objected to the project and 55.5% agreed with the project providing that adequate compensation and mitigation measures are taken to reduce traffic and to protect the environment. The primary objections to the project focused on compensation, changes in employment, loss of land by the residents, inadequate consultation with residents, loss of sandy beach and fishing grounds, destruction of scenery area and impact on Molundae cultural area, serious pollution due to timber and fishery industries, and the preference to see the area to be developed as residential area. Another consultation was again carried out in January 1994 as part of the final EIA preparation. Attempts were made by KMPA to hold a meeting with residents to explain and discuss the project. About 289 people attended the meeting, but the explanation and discussion were not possible due to the different opinions of the fishing community about compensation and the impact of the project on their livelihood due to the loss of fishing grounds.

12. The resettlement and compensation issue was dealt with in the feasibility study report and a compensation plan was prepared and submitted to the Bank before appraisal. The plan was reviewed and site visits and discussions with officials and the potential private investors were carried out during appraisal. The results are presented in Annex 9. It was recognized that in the basic design and compensation program, efforts were made to minimize involuntary resettlement and provide fair compensation to the affected groups.

C. EIA for Pusan Phase IV component

13. Description This component involves the construction of a container terminal capable of serving four 50,000 ships in Pusan Port. The implementation period for this component is 1991-1996 and the three main activities are:

* Construction of the container terminal and procurement of equipment. The total container yard area is 798,802 m2 of which 81% would be reclaimed. The terminal area extends into the sea up to 598 m from the existing shoreline and the total length of wharf is 2,968 m. Reclamation and construction of the wharf will be made using the "Paper Drain" method. About 625,000 m3 of rock would be acquired from the existing quarry site (Suk Mountain) located at the mouth of Nakdong River; the stone would be transported to the project site (28 km) via barges. Most of the landfill materials would be obtained from the dredging of the ship channel;

* Dredging of the existing ship channel (350 m wide). The direction of the channel would be modified and 150 m of the southern breakwater of the inner bay would be removed. The total dredging area is about 2.84 km2 and 11.6 million m3 of bottom sediment would be dredged and used for reclamation; and

* Construction of a 4-lane elevated expressway of 3.5 km long (called the 4th Phase Expressway) connecting the existing Woo Am Road at Kamman Dong and the #2 Expressway at Moonhyun. Land acquisition would not be required.

14. EIA study and approval. The Korean Container Terminal Authority (KCTA), under the supervision of KMPA, is the implementing agency for this component. The EIA study was carried out as part of the feasibility study with assistance from consultants, the Taeyoung Engineering and the Korea Technological Development Public Corporation. The EIA study was conducted from August 1990 to July 1991 and the report was prepared according to MOE's guidelines and the final report was submitted to MOE in late July 1991. Public consultation was later carried out and the results indicated no public objections subject to adequate compensation being provided to the fishermen and women divers who made a living, although illegally, in the area.

15. No separate site analysis was conducted for this component since the site is in an industrial/port area and it was identified several years ago as the location for the next container terminal.

16. The EIA for this component was approved by MOE in December 1991 and its approval conditions are summarized as follows:

* During construction, installation of drainage, reservoir, soil stabilization, landscaping are required in the areas where erosion is anticipated. For dredging and reclamation, the soft ground must be strengthened by Deep Cement Mixing method, the reclamation carried out by Paper Drain method, and the dredging must be done using pumps and silt protectors in the appropriate areas. When SS is over 25 ppm, the construction period has to be reduced and/or the method adjusted. For reduction of air and noise pollution, implementation of flying dust reduction measures including car washing, regular water spraying, using low vibrating machines, controlling working hours, installing sound-proof panels, and restricting car speed are required. If blasting is required, minimize the amount of dynamite, and provide early notification of explosions. All stone should be delivered by barges; and

* During operation, proper measures must be taken including sending waste water to Yongho treatment plant, installing proper measures (screen, settling pond) to prevent the possibility of waste discharge into the sea during rainy days, treatment of ship waste oil by sub-contractors, securing oil fence and chemicals in case of oil spill, installing sound proof walls at both ends of the elevated expressway, and implementing the monitoring plan. To reduce the impact on water flow, remove 150 m of the south-inner bay breakwater and 200 m of the north-inner bay breakwater. To prevent damage to residents, the detailed plan of daily construction and the amount and use of construction facilities should be made public. If damage is inevitable in certain areas, proper compensation should be made to prevent any complaints from residents. The compensation plan for those to be directly affected by the project should be made and implemented. A post management plan should be made and implemented and the results should be written following the specified format and submitted annually to the MOE Regional Office in Pusan in January. Any changes to these mitigation measures must be approved by MOE in advance.

17. EIA review. Review of baseline conditions showed that the proposed site is located on the eastern shore of Pusan outer bay at the site between the mouth of the inner bay and the Pusan 3rd phase container terminal. Two seaweed cultural areas are located near the mouth of the outer bay. The discharge of Dongchon stream still flows into Pusan Bay (BOD 36-46 mg/l). Measurements of the environmental quality in the area showed relatively high levels of nutrients, oil/grease, COD, Zn, Cu compared to the standards. The levels of Cd, Pb, and Cr+6 were also detected, but within the standards. In the bottom sediment, no contamination of CN, Hg, and As was found. The levels of Cd, Pb, Zn, Cu are slightly over the "reference value" according to the Netherlands standard. Since, all of the dredged spoil would be used for reclamation, the proposed dredging technique is considered acceptable. The level of air quality was relatively better than the average level in Pusan City. High levels of noise, exceeding the standards, were observed.

18. The study concluded that implementation of the project would increase capacity and efficiency of the container handling services in Pusan Port and would benefit the city of Pusan as well as the nation's economy. Removing part of the existing inner breakwaters would increase water flow in the inner bay. Negative impacts, however, are inevitable and the major impacts and the proposed mitigation measures are briefly summarized in Table A-2.

19. The final report was reviewed along with other related information, and found to be satisfactory. In 1992, KMPA/KCTA and the affected fishermen and women divers negotiated the level of compensation based on an assessment prepared by the Marine Research Institute and National Fisheries University of Pusan. A total amount of about W232 million ($290,000) was paid to 16 fishermen (including their boats) and 8 women divers in July-December 1992.

20. Construction of the embankment and part of the reclamation were carried out in 1992, and this component is expected to be completed by the end of 1997. Silt protectors were installed and SS levels are monitored every month. As of end 1993, over 26% of the total work has been completed and over 36% of land has been reclaimed. According to the MOE's report in early 1993, most of the EIA conditions were followed. In May-December 1993, 150 m of the south-inner bay breakwater was removed at a cost of about W1.3 billion ($1.6 million). Removal of 200 m of the north-inner breakwater will be made when the container yard is expanded at a later stage. No public complaints were recorded during the construction of this component. KCTA plans to submit the post-environmental management plan and results of the monitoring to MOE Pusan regional office by the end of January 1994.

E. Environmental Capacity and Institutional Needs.

21. KMPA/KCTA. According to the BEPA, the implementing agency is responsible for the preparation of the EIA, implementation of the mitigation measures, and monitoring of the environmental quality and the impacts. The existing capacity of KMPA and KCTA to deal with the environmental issues related to the port construction and operation, including monitoring, needs to be strengthened as soon as possible. A training program has been developed and agreed upon as part of the technical assistance component of the project (Annex 6). In addition, technical assistance will be provided in the project to develop sample TORs for EIA studies, and standard operating procedures and engineering guidelines will be prepared to retrofit existing port facilities to minimize the pollution caused by port operations.

22. Coordination and cooperation among concerned agencies is also a key issue, especially in the area of consultation to the affected groups, waste management, and oil spill contingency plan. The EIA report for Pusan 4th Phase identified the need to establish an oil spill management office in KMPA to monitor careless discharge of ship wastes and waste oil and to prepare equipment and chemicals necessary to deal with oil spills, but no details was given. The possibility to establish a separate office responsible for oil spills was discussed in KMPA, but not much progress has been realized. Efforts would be made during the implementation of the project to address this issue.

Table A-1 Summary of negative impacts and its mitigation measures for Dadaepo component. ***to be completed after receiving the supplementary ***

Impacts	Mitigation Measures
During construction. **a) Changes of topography/sea bed/ water flow.** Loss 1,623,000 m2 of sea area; loss of Kuen Son Mountain and a small island; quarry of 950,000 m3 of rock; 1,650,000 m3 of soil; and 9,050,000 m3 of sea sand; reduction of coastline by 2.4 km; loss of 900,000 m3 bottom sediment.	* These impacts are inevitable; contamination of heavy metals at the disposal sites due to the dredged spoil are not expected; possible impacts at quarry areas will be taken care of by the private developer. * No mitigation measures is given.
b) Partial loss of land and marine ecology. Small impact on greenery due to demolition of Kuen Son mountain and the island; small impacts on migratory birds since the site is located far below the freshwater area of the Nakdong River where most of the migratory birds are congregated. The loss of fishery areas and fishing rights are significant.	* These impacts are inevitable; loss of fishing right will be compensated according to the law.
c) Degradation of water quality/ marine ecology. Increase in SS and other water pollutants. Modelling at the breakwater construction site showed the affected area of less than 1.5 km2 where SS level would be increased by 3-5 mg/l.	* achieve the sea reclamation in stages; use pumping/dredging ships which produce low SS; perform regular monitoring of the SS level and reduce construction time if the SS concentration exceeds 25 mg/l; install silt protectors (up to 90% can be reduced). * Measures will be taken to prevent direct dumping of sewage and other wastes from the site.

d) Increase of air/noise pollution. During construction, emissions of air pollutants will be 195 micro gm/m3 TSP; 0.01 ppm SO2; 0.03 ppm NO2; and 2.0 ppm CO; only the TSP near the project site of 195 micro gm/m3 exceed the standards, but this is believed to be temporary due to construction of a residential apartment. During operation, small amounts will be increased due to the project: 12 micro gm/m3; 0.033 ppm SO2; 0.055 ppm NO2; 0.081 ppm CO. Measures will be taken, however, to reduce the impacts. During construction, noise level would be 70 dB(A) at the residential area located about 1,000 m from the proposed site. This level is at the upper limit of the standard for construction sites (70 dB(A)). Based on the estimated amount of construction traffic of about 60 trucks/day, the noise level due to this source at a distance of 10 m away from the road was estimated to be 52.8 dB(A) which were within acceptable standards. Careful management of the noise control program will be carried out.	* Use construction equipment and vessels with low noise; proper maintenance of equipment, vessels and vehicles; attach sound arrester to construction equipment and vessels; limit construction time; pave road; effective monitoring of work progress; restrict movement of equipment; limit driving speed (40 km/hr) and the use of horn; install a sound proof wall at the nearby school; install car wash facilities during construction; plants trees and buffer area; prepare and implement management plan for control of air and noise during construction and operation; and monitor air and noise quality near the project site.
e) Other impacts. Wastes from construction site will be increased due to construction and labor; about 2,060 l/day night soil will be generated; * About 60 trucks/day are expected for transportation of rock/soil. This impact is inevitable.	* Provide mobile toilet and subcontract for collection and treatment; solid waste will be collected and disposed of by the Pusan City.
<u>During operation.</u> **a) Change in water flow.** In Dadaepo Bay, the tidal level will increase about 1 cm; the current speed near the bay mount will decrease by 50%; the current speed will be about 1-5 cm/sec in the head area, 5-10 cm/sec in the middle area, and 5-30 cm/sec near the bay mouth. Alternatives for basic design of the breakwater were carried out to assess its influence on water flow in the bay.	* It is recommended that a 50 m distance should be provided between the Kyung do island and the proposed southern breakwater to increase water circulation in Dadaepo Bay.

b) Degradation of water quality and marine ecology. About 11,000 m3/d of wastewater would be generated (BOD 1,064 mg/l; 637 mg/l SS) from the complex; possible oil spill due to accidents.	* Provide a wastewater treatment facility for the complex; equip an oil separation tank to remove SS and oil; and equip an oil removal boat and oil fence for oil spill maintenance; monitoring of water quality and marine ecology.
c) Increase levels of air/noise. Air pollutants will increase by 12 micro gm/m3 TSP, 0.033 ppm SO2, 0.55 ppm NO2, and 0.81 ppm CO; TSP from the operation of equipment must be reduced as much as practical. * noise level at a distance of 10 m from the road will be 68.7 dB(A) and exceed the standard of 65 dB(A) and thus requires special attention.	* cover transport vehicles; prohibit overload and speed; pave all roads; and clean all vehicles before operation. * limit vehicle driving speed to less than 40 km/hr when passing through the residential area; prohibit the use of horn; install greenbelt and soundproof wall. * monitoring air/noise levels.
d) Increase generation of wastes. Wastes expected to be generated from the complex and its employees are about 11,000 m3/d of wastewater; 33,434 t/y of solid waste of which 13,294 t/yr come from marine foods processing zone; 5,005 t/yr from heavy industry (1,702 t/y of special waste); and 15,135 t/yr from the timber processing industries; about 21,181 t/y of waste from timber and marine-product processing industries can be reused; the remaining 12,253 t/y will be disposed of at Sang Guk Dong sanitary landfill. * generation of ship waste (496 ships) is estimated to be 73.8 t/yr.	*Install wastewater treatment facility at capacity of 11,000 m3/d. * Separate solid waste for reuse; * Make contract arrangements for the disposal of ship waste; waste oil will be separated and treated according to the Pusan city waste treatment plan. * In case of marine accident, cooperate with related agencies for immediate actions; control incoming and outgoing for safety.

Table A-2 Summary of impacts and mitigation measures for Pusan Phase IV component.

Impacts	Mitigation Measures
During construction. a) Change of topography/water flows. Loss of 647,559 m2 of water area; length of shoreline increase by 1 km; increase water depth; and possible ground subsidence in the soft areas.	* Use special treatment (Deep Cement Mixing and Paper Drain methods) in reclamation; * Other impacts are inevitable.
b) Loss/degradation of water quality/marine ecology. Increase of SS and destruction of seabed would reduce productivity of phytoplankton and reduce numbers and species of bottom animals; the area affected by high SS of more than 3 mg/l would be less than 6 km2; no serious effect on water quality and no significant impact to the nearby fishing ground located about 2 km from the site; * High SS due to erosion and construction of the access road.	* Use pump dredge to minimize the level of SS; use silt protector near spillway; control working intensity and time according to the periodic survey of SS in surrounding area of work site; install silt protector near fishing ground. * Monitor SS level every month; monitor marine plankton every three months. * Construct road during dry season and construct temporary drainage and weir works.
c) Increase air/noise pollution. About 492 tons of SO2, 306 tons of CO, 1,176 tons of NOx, and 63 tons of TSP would be generated from equipment and 208 tons of dust from dump trucks; ambient levels at the nearby residential areas (Kammandang, Yongdamdong, and Jangrim) are still within the standards; noise level is expected to range from 54-68 dBA at a distance 130 m away;	* reduce dust generating by regularly apply water spraying, wheel cleaning, and car washing, etc to the vehicles; reduce flying dust from the aggregate yard by covering; reduce the level of pollution by efficient operation and maintenance of the equipment; * work during the day time and avoid working at night time; limit speed of vehicles at 20 km/hr; install movable sound barrier;
During Operation d) tidal change less than 1 cm; current velocity decrease about 25% at breakwater; tidal volume and water replacement ratio increase by 5.8% and 2.2% at the inner bay and 3.1% and 1.4% at the outer bay; tidal movement would be smoother;	* Increase water exchange volume by demolition of 200 m of the north-inner breakwater (cost about 3.5 billion won or $4 million). The increase in the inner bay would be about 5.8% while that in the outer bay would be much smaller.

e) Degradation of water quality due to discharge of runoff, soil contamination, and discharge of sewage and other wastes.	* Properly collect and handle engine oil by using 200 l drum for container and send to the oil recycling firm or industrial waste disposal specialist. * Sewage from wharf facility will be piped to Yongho sewage treatment plant; equip surface water drainage system with holding and separation tanks to prepare for oil spillage; and strengthen KMPA capacity to deal with oil spill. * Monitor COD, plankton every 4 months.
f) Increase air/noise levels: SO2, NO2, CO, TSP would be 3-12 ppb, 2-6 ppb, 0.4-1 ppb, 205 micro g/m3 respectively; at the entrance, noise level will be 61 during daytime and 56 dbA at nighttime in 1966 and 63 dbA and 57 dbA in 2001.	* Install a 1.9 m high sound barrier on the elevated road: 170 m long for the entrance lane and 150 m for the exit lane; the noise level would become 58 dBA in 2001 during daytime and 50 dbA during nighttime.
g) Increase of water supply and generation of wastes. Water demand increases by about 3,271 m3/d; daily generation of general wastes in the site area is about 2.4 tons in year 2001; night soil 1.5 kl/d;12.	* Wastes will be collected by separate system and disposed of according to the Pusan City waste disposal plan; night soil and domestic sewage will be piped to Yongho sewage treatment plant; wastewater will be piped to Yongho sewage treatment plant.
h) Increase land and marine traffic volume. Traffic volume of the existing roads will be 2,467-5,283 PCU/hr and that of the 4th Phase elevated road will be 2,925 PCU/hr; marine traffic will be 2,059 in-bound cargo ship and 1.2 million TEU in-bound container volume.	* Assign one-way traffic to the access road; built a new elevated road for cargo carriers; modify direction of the channel alignment; install safety equipment: light buoys, sector lighting, fog signals and other navigation aids along the channel.

KOREA

PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Methodologies for Determining Environmental Costs and Benefits of Port Projects

A. Introduction

1. The focus of this Annex is on environmental issues of particular relevance in determining the feasibility of specific port investment components. A case has been selected which covers a broad range of methodological issues concerning environmental impacts that a port authority (national or local) is likely to face.

2. The case relates to the relocation of polluting industrial activities and port facilities serving these activities within city boundaries to more appropriate sites. Such relocation decisions involve major land reclamation, land-use changes and resettlement which require careful planning and the implementation of appropriate compensatory measures. Rapid urbanization often results in co-habitation of residential and industrial activities which are often polluting, and accelerate environmental degradation even further because of the accompanying truck traffic which moves between industrial sites and the port. Proposals to relocate these activities, as well as the port facilities which serve them, outside of residential areas requires that the analysis be broadened from the rather narrow base provided by a cost effectiveness valuation to a full cost-benefit analysis which defines and compares alternatives, quantifying (as far as meaningfully possible) environmental impacts, both positive and negative. An important input to such analyses is the identification and measurement of dose-response relationships of environmental impacts. Some of the positive impacts resulting from relocation would include: reduced industrial pollution in and around existing industrial sites and other reductions in pollution resulting directly from decreased truck traffic (i.e. congestion, accidents, etc.). One of the main negative impacts would include the diversion of industrial pollution to the new sites and their surrounding areas. The particular case chosen for illustrative purposes also shows the costs of foregoing a low-cost alternative in favor of a much costlier one which is certain to have no adverse environmental impacts on a unique wetland area of crucial importance to migratory birds and the local marine ecosystem.

3. This case can also be expanded into dealing with the relocation of traditional port activities, which are increasingly affected by urban growth, to a new and "virgin" location far removed from potential negative impacts and limitations of urban development. In those cases where port and urban activities are in serious conflict (social, environmental as well as economic), and where the port's main clients are increasingly beyond the boundaries of the city in which it resides, a case may be made for limiting port growth and shifting relevant traffic to a new location. In the case chosen, the analysis explores the diminishing central role of housing certain port related activities in the city; the increasing environmental costs to the population for maintaining the current role of the port; and the viability of developing a "sister port" far removed from the city, but one where present shipper/client relationships

are not adversely affected, and where future increases in port traffic can be accommodated without undue pressure associated with urban development. In this case, development at the city port is limited to facilities in operation, while the full cost-benefit analysis focuses on the future role of the city port, taking into consideration changes in transport costs, as well as the scope for diversion of port traffic to a "sister port" free of those negative social and physical environmental impacts which would so adversely affect the economy and environment of the port city in question. These expansion aspects of the methodology will, however, not be pursued further in this Annex.

B. Case Study: The Korean Experience of Site Selection for Joint Industrial and Port Relocation in Pusan; the Role of Environmental Considerations

4. In order to illustrate the issues addressed in Section 1 above, the following Korean port and urban development project components are discussed in detail and include the relocation of: (a) timber and fishery terminals from the central port area; and (b) polluting timber and fish processing plants from within residential areas in the city (Pusan) to an industrial site adjacent to Pusan Port (Dadaepo) developed specifically for the purpose. The Dadaepo project components have been classified "Category A" and as a result require an Environmental Impact Assessment (EIA), which includes public hearings. In terms of social impact one important element of the EIA includes a careful mapping of potential involuntary resettlement of people plus an appropriate plan for removal and compensation of those affected.

5. These investments require economic and environmental quantification of costs and benefits to determine the extent to which Pusan and Korea will benefit from the proposed relocations, the goals of which are to: (a) reduce congestion and associated transport costs including related environmental damage resulting from excessive traffic between the port terminals for timber and fish, and their processing areas, which are, in many cases, far from the port; (b) improve the environment in and around those residential and commercial areas affected by the present timber and fisheries processing plants and timber and fisheries port facilities; and (c) minimize the negative environmental impacts around the proposed Dadaepo-location, with particular emphasis on protection of the marine ecosystem at the mouth of the Nakdong River.

6. The initial design of the Dadaepo project entailed land reclamation and construction of port and industry facilities on the east bank of the lower Nakdong River, i.e. the western side of Dadaepo. This area was considered well protected against the ocean, and as a result minor breakwater investments would be required. However, in the lower Nakdong river is a famous wetland area serving as transit base for a large variety of migrating birds and constitutes an integral part of the local marine ecosystem of which these birds are a key component. The Ministry of Environment considers this wetland area and the surroundings so fragile and threatened that an area covering the island, the lower reaches of the river, and part of the Nakdong River shores of Dadaepo has been established as an environmental protection area. The initial Dadaepo project design assumed that the part of the protected shores along the east bank of the Nakdong River needed for the project would be exempted from the protection clause, since it was uncertain to what extent the marine ecosystem and the migratory flows and pattern of birds would be adversely affected. Such uncertainty was unacceptable to the Ministry of Environment. As a precautionary measure, the port authorities proposed an alternative Dadaepo project design facing the cove on the east side of Dadaepo. This Cove alternative is completely sheltered from the Nakdong river and thus would have no environmental impact on the protected area. However, this alternative is exposed

to the open sea, and requires extensive breakwater construction at very high costs in order to provide for safe port and shipping operations. Both alternatives would yield substantial reclamation of land needed for the relocation of port and industrial activities, but more such land would be reclaimed in the Nakdong alternative. Such land is scarce and valuable in Pusan. Both alternatives will relieve existing residential areas of industry and traffic pollution, compared to the "base case" alternative of not relocating the timber and fisheries port and associated industrial processing activities in the feasibility analysis, but with more industrial activities relocated with the Nakdong alternative, inland transport cost savings and related environmental improvements will be greater. It is important to keep in mind that the impacts of technological progress, anti-pollution measures and traffic policy measures undertaken in Pusan during the projected life of the project, will affect both the "base case" and the two alternative Dadaepo alternatives.

C. Environmental Economic Project Benefits and Costs

7. In addition to conventional economic costs and benefits that can be determined using market prices, the Dadaepo project components require that a series of direct and/or indirect valuation methods be used to establish estimated values of some important environmental impacts associated with the proposed project (see section D below). All components are calculated net of taxes in fixed prices.

8. Apriori it would be expected that the appraisals would depend fundamentally on changes in land use and associated changes in traffic. The reason is that variations in traffic will yield variations in the amount of congestion and environmental spillovers avoided with the proposed project components, thus substantially impacting appraisal results.

9. The socioeconomic costs of environmental damage may in principle be quantified on the basis of the following, although in determining these costs great care must be taken to avoid double counting:

(a) Reduced export earnings potential;

(b) Reduced incomes for commercial and artisan fishermen;

(c) Reduced availability of protein source;

(d) Employment loss;

(e) Increased incidence of human disease and mortality;

(f) Loss of productive days of work;

(g) Pollution damage to build up; structures/buildings/machinery;

(h) Reduced attractiveness of coastal zones/shorelines for residential and recreational activities; and

(i) Transport and congestion impacts.

10. The main environmental and economic costs and benefits attributable to the proposed Dadaepo components include:

(a) **Physical Changes and Resource Uses** (other than those associated with traffic) resulting from construction and operation of new port facilities are included in the analysis as project costs.

(b) **Physical Changes and the accompanying Economic, Ecological and Social Impacts** (other than traffic) resulting from relieved pressures in the present timber and fisheries terminal areas in the port are included in the analysis as project benefits.

(c) **Physical Changes and Ecological and Socioeconomic Impacts** (other than traffic) resulting from relocation of the timber and fish processing plants to Dadaepo are included as both costs and benefits.

(d) **Traffic Impacts**, i.e. changes in amount of traffic and associated changes in direct vehicle costs, road investments and maintenance costs, and the indirect costs of pollution and traffic accidents.

11. Korean data, or alternatively, comparable and transferable empirical knowledge from elsewhere, would be used to determine the extent of quantification possible respecting the above impacts. This information would be used to establish reduced or increased damage from the proposed project components relative to the existing situation: (a) maintaining timber, and (b) fish processing operations in the existing respective port terminals and processing areas.

D. Valuing the Environmental Changes

12. There are several economic valuation methods available for determining the environmental costs and benefits of developing the Dadaepo site to replace the existing timber and fish terminal and timber and fishing processing areas.

13. The two main methodologies which may be used include: an indirect approach based on surrogate market prices, and a direct approach based on "willingness to pay" interviews with those

affected. In the former category, the discussion is limited to the so called "property value" method.[1] The theoretical assumptions and practical conditions determining the appropriateness of each method as they relate to this particular project are briefly discussed below.

The Property Value Method (Hedonic Price)

14. Property values are affected by many variables including size, use, construction, location, and quality of its environment. When the impact of all variables other than the environment are controlled or regulated, much of the price differential between similar units of property can be related to environmental impact.

15. Fundamental to the validity of this valuation method (referred to as the hedonic price valuation method) is: (a) that property purchasers reveal their attitude to the various property attributes by their willingness to pay; (b) that there exists an efficiently functioning property market which allows the various property attributes to be reflected in price; (c) that the actors in the property market have fair access to value relevant property information (zoning plans, infrastructure development plans, etc. that are likely to influence key property attributes); and (d) that there are a sufficient number of property transactions taking place with relevant properties so that price variations respecting environmental variable(s) of interest to project valuation can be traced with some satisfactory degree of confidence.

16. Typically, multiple regression analysis is applied to a large set of property transactions in the relevant study area. This determines the coefficient of the environmental variables of interest with the estimated coefficients expressing the value of an incremental change in the variables in question.

17. Alternatively, still assuming that the above (a) - (c) conditions are satisfied, but short of the necessary actual transactions (d), a secondary approach is to supplement whatever transaction data available with property value estimates from real estate agents that know the area in question.

18. Both approaches have been tried out extensively in many countries to determine environmental impacts. The derived environmental values have been compared to environmental values derived by means of the direct contingent valuation method whereby a sample of users are asked to reveal

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[1] The other most common surrogate price approach to estimating environmental value is the so called "Travel Cost Method" whereby the incidence of travel from a zone to a given site is used to derive the demand, i.e. the willingness to pay for environmental amenities identified at the site in question. The assumption is that the longer the distance from the zone to the site, the greater the cost of going there compared to going to a competing site, and as a result, demand for the site in question drops as the costs of going there increases. Research in recent years have found that the assumptions that need to be satisfied in order that this method shall give satisfactory and reliable results for use in project appraisal, are so unrealistic that the entire method has lost confidence as a means to pricing and valuing the environment.

their willingness to pay for environmental improvements, or to pay for avoiding environmental worsening (see following section). Recent research suggests that there is convergence in the estimates derived by the two methods when conducted properly[2].

The Contingent Valuation Method (CVM)

19. Contingent valuation is a direct valuation method whereby affected people are asked about their willingness to pay for an environmental improvement or to avoid a deterioration in environmental quality. Such willingness to pay can be motivated by both use value (the monetary value people place on being able to physically use the resource, e.g. the recreational value of some activity) and non-use values (the monetary value motivated by the desire to preserve the environment for now and the future).

20. The use of the CV method requires careful design and testing of the survey questionnaire before it can be assured that the respondents are in fact revealing an unbiased willingness to pay. As in all economics, it is fundamental to the validity of the analysis that the subjects interviewed have adequate knowledge of the alternatives and changes they are asked to value. People are typically asked hypothetical questions such as: "If this happens, what would you be willing to pay?" Due to the hypothetical nature of this method, several biases may occur[3].

21. In spite of the potential biases, the CV method, if properly designed, offers a unique possibility for finding the "total value", i.e. both the use and non-use values, including the value of future environmental changes.

E. Proposed Project Appraisal Framework

22. The main objectives of the proposed Dadaepo developments are to:
Reduce the costly waiting time of ships due to port congestion which results in time-consuming discharge at lighterage stations:

(a) reduce the high stevedoring costs resulting from continued use of lighterage stations;

(b) reduce the operating costs per truck trip which is based, among other things, on the number and running distance of those trucks required to carry out transport services between the port and the processing areas;

(c) reduce air pollution from timber and fish truck traffic;

(d) reduce the number of related truck traffic accidents;

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[2] For an extensive state-of-the-art survey of theory and practice, see Ståle Navrud (editor) 1993, "Pricing the European Environment", Scandinavian University Press, Oslo.

[3] See Ståle Navrud (Editor), 1993, op. cit. for a detailed discussion of the various biases, and how the methodology has been developed and tested to eliminate such biases.

(e) reduce the road investment and maintenance requirements resulting from heavy truck traffic;

(f) reduce the incidence and extent of environmental disturbances (noise, air pollution, visual ugliness, etc.), in particular for those residential and recreational areas adjacent to the present processing plants, and to the timber and fish terminals respectively, by relocating the these plants to Dadaepo;

(g) reduce congestion costs for other traffic; and

(h) reduced air pollution from swifter movement of other traffic.

23. However, the project components will also generate some environmental costs in the form of:

(a) Reduced residential and recreational attractiveness at Dadaepo where there is now a beach and complementary recreational activities;

(b) Compensation to fisherfolk for loss of income from fishery rights at Dadaepo and compensation to those businesses/landowners whose properties require expropriation; and

(c) Depending on the actual site-specific Dadaepo layout adopted, i.e. the Cove versus the Nakdong alternative, there could be an environmental cost related to site-selection, stemming from potential marine ecosystem impacts on the wetlands of the Nakdong River mouth.

24. The Dadaepo analysis assumes a declining growth rate in timber traffic as compared to historic data, from a 3.8% annual growth between 1996 and 2001, to 0.5% between 2001 and 2006, and then 0.5% after 2006. At the same time, it is assumed that the share of processed lumber in overall timber imports will increase from 10% in 1996 to 30% by 2011.

25. For the affected fish processing industries, the overall imports of raw fish is expected to almost double between 1991 and 2011. Containerized imports constituted 14% of imports in 1992, but is expected to triple in volume, and the share is projected to rise to 20% by 2011. Exports of processed fish products are projected to almost double as well, but here the containerized share, which had reached 33% in 1991, is projected to increase only marginally to 36% by 2011.

26. It is the projected development in these two processing sectors, and the associated demands on port facilities, street space and vehicle use, and land for location of processing facilities that determines the feasibility of the proposed Dadaepo developments. The feasibility analysis has taken the following components into account.

27. The construction costs for the Dadaepo port facilities, including land reclamation for the timber and fish processing areas have been estimated at market price on a yearly basis for each of the construction stages, and have been applied to both the Nakdong River and the Cove alternatives. The operations and maintenance costs have been estimated on the basis of past experience in Korea.

28. The economic value of conventional improvements based on reduced truck traffic operating costs, reduced ship waiting time and cargo handling costs has been estimated by: (a) determining annual truck operation costs and the resultant savings accrued from a reduction in travel distance from the new port terminals to the new processing facilities; (b) the associated time savings for drivers; (c) the resulting savings in road maintenance and investment costs; (d) determining vessel costs resulting from delays attributable to lighterage, used in cases where port facilities are unavailable; (e) determining savings resulting from decreased handling of cargo due to lighterage.

29. The economic value of reclaimed land for use as port and processing facilities, as assessed by real estate assessors with extensive local knowledge of the commercial real estate market

30. The economic value of environmental improvements from reduced truck traffic over the project life have been estimated on the basis of referenced studies (Korean) and projected income levels. Referenced US methodology for valuing: (a) air quality improvements and noise reductions on affected people and property; and (b) savings from reduced number of traffic accidents, has been applied to these studies.

31. The economic value of environmental improvements based on property value changes around: (a) the present timber and fish terminals; and (b) the present timber and fish processing areas, have been estimated on the basis of assessments by local real estate agents. The basis for their assessment is a mixture of contingent valuation (since these agents are presented with visual aids showing the planned development and can see how the residential and recreational areas will be affected) and their experience with regard to property value differentials for the rather homogenous high rise apartments with and without such port--and industrial activities--nearby. It is claimed that sufficient observations exist to make a reliable assessment of property price changes.

Attachment

Environmental Benefit Cost Analysis of Dadaepo Port Development: Appraisal Results

A. Introduction

1. In the following, the assumptions and methodology used to determine the robustness/sensitivity of the benefit-cost conclusions with regard to some key (and controversial) environmental parameter values are presented. The purpose is to clarify for decision makers what assumptions actually underpin the conclusions.

2. After an analysis of alternative sites, the results focus on the Cove alternative where both timber and fish will be received at the port, and where both timber and fish processing plants will be relocated. The rejected Nakdong alternative was planned for timber processing plants only, but many more than in the Cove alternative. No fish processing plants were planned for relocation in the Nakdong case.

3. The Cove alternative implies substantially higher investment costs, compensation costs, operation and maintenance cost (because these latter costs are calculated as a fixed percentage of construction costs), as compared to the Nakdong alternative. The Nakdong alternative, on the other hand, would imply twice as high losses in land values to residential areas near Dadaepo as a result of the magnitude and location of the port and processing area. However, the Nakdong alternative, which is by far the least costly to develop, was ruled out by the MOE so that the marine ecosystem in the lower reaches of the Nakdong river, which caters to many species of migratory birds, could be preserved. MOE accepted the alternative referred to as the Cove alternative, located to the South-East of the Nakdong site. This alternative is, however, far more costly to develop.

B. Appraisal Results

Project Costs

4. Economic project costs were derived from the financial estimates by excluding all taxes, duties and transfer payments. Economic costs included: (a) construction costs of the wharf, breakwater, terminal and industrial site (including land reclamation, but excluding plant buildings); (b) operation and maintenance costs of the port facilities; (c) compensation payments for loss of property and income from e.g. licenses to fish or harvest seaweed in affected areas, see table 15 for details on the chosen Cove alternative; and (d) loss in value of those residential properties located near the new port and processing site, and thus environmentally adversely affected by it. The direct cost difference, including compensation for loss of fisheries and seaweed income, is estimated to be US$128.9 million in favor of the Nakdong alternative. However, the anticipated loss of property value due to environmental deterioration from having the port and industrial processing plants established and working adjacent to established residential areas, is estimated to revert the overall difference to US$ 7.3 million in favor of the Cove Alternative, see the table below:

Undiscounted Project Costs (March 1994 prices)

Cost Item	Nakdong Alternative (US$ mill)	Cove Alternative (US$ mill)
Construction (incl land recl)	331.3	389.7
Port operations/maintenance	166.9	212.6
Compensation for income loss	10.8	35.6
Property value losses	272.5	136.3
Total	781.5	774.2

5. Project benefits were based on: (a) inland transport-related savings resulting from a reduction in the total number of truck- trip kilometers required between the port and the processing plants, reduced traffic accidents, travel time savings, reduced street maintenance and construction, and reduced air pollution costs along the streets were truck traffic is reduced; (b) reduction in lighterage activities required for loading and unloading vessels (listed as reduced stevedoring costs), and reduced ship waiting time in port; (c) increased value of inland residential areas from where polluting industries are relocated to the new port area at Dadaepo; and (d) value of reclaimed land.

6. The difference in benefits between the chosen Cove alternative and the rejected Nakdong alternative are due primarily to the fact that a significantly larger piece of land is reclaimed with the Nakdong alternative than with the chosen Cove site. Thus the Nakdong alternative would have allowed for the relocation of a larger number of processing plants than will be the case with the chosen Cove alternative. This again explains the difference in the reduction in inland traffic between the two alternatives, and why more residential inland sites would have benefitted from the Nakdong alternative. However, the Nakdong alternative was rejected by the MOE in order to avoid the risks of environmental damage to the fragile protected marine ecosystem at the mouth of the Nakdong river.

7. It is of interest to observe that whereas overall undiscounted costs were only US$ 7.3 million lower (see above table) for the Cove alternative, the quantified benefits were as much as US$ 373 million lower (see table below). The two dominating factors reducing the value of overall Cove-benefits compared to those of the rejected Nakdong alternative, were US$ 370 million less because less land is reclaimed, and US$ 219 million less land value appreciation in inland residential areas because fewer timber processing plants can be relocated.

8. On the other hand, for reasons of the different relocation configurations of the two alternatives, and the addition of port facilities for shipments of fish and fisheries products to the Cove alternative, it will have substantially higher ship related savings than the rejected Nakdong alternative.

Undiscounted Project Benefits (March 1994 prices)

Benefit Item[1]	Nakdong Alternative (US$ mill)	Cov Alternative (US$ mill)
Reduced ship wait time	336	466
Stevedoring cost reduction	182	338
Inland transport cost savings	199	137
Air pollution cost reduction	49	53
Travel time savings	25	17
Traffic accident reductions	5	3
Reduced road constr. and maint.	7	5
Residential land value apprec.	625	406
Reclaimed land	1250	880
Total	2678	2305

[1] Air pollution reduction is measured only as a result of reduced truck traffic along the routes between the port and the processing plants, whereas the residential land value appreciation is independent of traffic volumes on these roads, and reflects the mere presence and nearness of noisy and polluting timber processing plants within 50 meters of residences. This way of measuring environmental benefits thus avoids the trap of double counting.

9. If the economic valuation of such environmental impacts as: (a) the loss of environmental quality of residential areas and recreational land at Dadaepo (valued as loss of real estate value in a defined residential fringe); (b) the loss of income of fishermen due to planned development (valued as compensation to be paid); (c) reduced air pollution along the truck roads; (d) reduced traffic accidents; and (e) improved environment for residential areas around the present timber processing plants that will be relocated (and replaced with residential or non-polluting commercial development), are included (however, no residential land value improvements are assumed from the relocation of fish processing plants, because their pollution impact is experienced as much less severe in the surrounding residential areas), the net present value of the Cove alternative becomes US$379.4 million, with a benefits-costs ratio of 1.94. The corresponding economic internal rate of return (EIRR) of the Cove alternative is 36.3%. This must be considered a very attractive economic rate of return indeed.

10. It is of interest to compare the discounted benefits and costs of the rejected Nakdong alternative and the chosen Cove alternative. The present value (at 12% discount rate) of the project costs are US$ 74.366 million higher in the chosen Cove alternative, whereas the present value of the Cove alternative benefits are US$ 64.931 million lower than for the rejected Nakdong alternative. In other words, the non-monetized benefits attributed to retaining an undisturbed marine ecosystem and wetland for birds in the lower reaches of Nakdong River, amount to no less than US$139.297 million, when discounted at 12%.

11. Since the costs are high, and the dominating benefit components are rough estimates, and not entirely uncontroversial, it is of considerable interest to establish the sensitivity of the economic feasibility

indicators of the chosen Cove alternative to changes in some of the key feasibility assumptions. Initially, conventional engineering sensitivity analyses establishes the robustness of the above base case conclusion: The EIRR drops marginally to 30.7% if total costs are increased by 15%, to 29.8% if total benefits are reduced by 15%, and to 24.5% if both cost are increased by 15% and benefits reduced 15%. The corresponding net present values at 12% discount rate are US$ 398.890 million, US$ 327.745 million, and US$ 252.333 million, respectively.

12. Next, return to the base case, and then delete all conventional environmental costs and benefits, while retaining the real estate value of reclaimed land. This reduces the net present value to US$ 320.560 million, corresponding to a benefit-cost ratio of 1.82, and the EIRR to 31.8%.

13. Perhaps most interesting among the sensitivity tests is the alternative where conventional environmental benefits and costs are retained, but where it is assumed either that: (a) the inland processing plants to be relocated are replaced with other equally polluting industries; or (b) that the environmental improvements in these established residential areas around the processing plants to be removed, have zero economic value. In this case (the calculation is the same for (a) and (b)), the net present value drops to US$228.384 million, corresponding to a reduction in the benefit-cost ratio to 1.45, while the EIRR drops to 23.3%. This suggests that the proposed Cove alternative is economically attractive and robust as regards the underlying assumptions adopted regarding the valuation of environmental impacts.

14. Project feasibility hinges critically on one factor; the value of reclaimed land for industrial relocation purposes at Dadaepo. If this benefit is removed altogether from the base case, the net present value at 12% discount rate becomes negative at US$25.033 million, corresponding to a benefit-cost ratio of 0.95, while the EIRR drops to 10.8%, which is slightly below the 12% discount rate required for a positive net present value, i.e. economic feasibility of the project.

15. In other words, the project's feasibility appears to be robust towards the various downside risks for which it has been tested. It should, for example, be noted that no value has been attached to the part of the reclaimed land being allocated for port operations in the base case, even though it frees up port areas central Pusan presently used for timber, fish, and fish products for alternative uses. Second, the residential land value lost from being within 50 meter of timber processing industries has been assumed to be 17 percentage points off the residential land values more than 50 meters away, based on real estate transactions in these areas. In the case of the Cove alternative, the relocated industrial plants will be much further away from the existing residential areas just north of Dadaepo. And yet, the feasibility study assumes the same relative loss of residential land values north of Dadaepo. The estimated absolute unit loss figure implies a land value in this area which is almost twice as high as the land value assumed for the reclaimed land. Local real estate experts claim that this estimated value on the reclaimed land is on the low side. Third, private industry is clearly interested in buying the reclaimed land for relocating their processing plants. In other words, at the assumed land values in present and future locations, private industry see relocation to Dadaepo as an attractive option. In conclusion, since project feasibility is retained even when the value of this reclaimed land is given close to zero value (while the full costs of reclaiming it are included in the study), it seems safe to claim that this is an attractive development project.

KOREA MARITIME AND PORT ADMINISTRATION

PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Assumptions for Financial Projections
1993 - 2000

BASIC REFERENCE DOCUMENTS USED IN FINANCIAL ANALYSIS

Actual and Forecast Income Statements

- Non-operating income denotes reversal of bad debt allowance and rental from non-operating assets.
- Other Non-Operating expenses denotes compensation to civilians, foreign exchange loss (gain), expenses for school and secondary port operation, and net of miscellaneous income and expenses.
- Extraordinary loss (gain) denote loss (gain) from disposal of fixed asset and casual loss.

Current Accounts Schedule

- Projected accounts receivable = operating revenue * 1.5%.
- Projected Inventory = (inventory from '89 -'91)/(oper. expenses from '89-'91) * projected operating expenses.
- Projected accounts payable & other = (A.P. & other from '89'91)/(C.I.P. from '89-'91) * projected C.I.P.
- Accrued liabilities projected growth rate of 4%

Fixed Assets Scheduled

- Property contributed by private sector is added to fixed assets after 4 years of construction period.
- Capital spending to fixed assets is based on the forecast data prepared by KMPA.
- Construction in progress is assumed to be completed in four years and transferred to fixed assets at the end of the year.
- KMPA revaluates fixed assets every five years in accordance with the law on management of Government owned property. However, model assumes that revaluation of fixed assets is done annually at a rate of 3% (85% of increase in wholesale price) to revaluation surplus.
- Depreciation was computed using the ratio derived from historical data as below.
- Non-Operating assets using the ratio derived from historical data as below.
- Depreciation expense was allocated to operating assets and non-operating assets using the ratio 91.7%.

- Depreciation is computed using the ratio 1.63% - based on historical data.

Unearned Income Schedule

- When KMPA receives property donated from private sectors, KMPA treats it as an item under equity on the balance sheet and never amortizes.
- However, for the purpose of forecast, the model assumed that KMPA will treat it as unearned income on receiving the donation after 4 years of construction period and will amortize it over 15 years.

Revenue from Port Facilities Schedule

- Based on projected cargo volume and projected changes in the average ton price
- Revenue from Rentals
- The average actual figure for 1988 thru 1991, i.e., (24,109) was applied as the forecast.

Other Revenues

- The average actual figure for 1989 thru 1992, i.e.. (13,102) was applied as the forecast.

Operating and Non-Operating Expense Schedule

- Salary expense assumes on 8% annual rate increase and a 1% increase in the number of staff.
- Maintenance and administrative expenses are projected to increase at a 4% annual rate.
- Repairs are forecasted to grow at a 16% annual rate.

KOREA CONTAINER TERMINAL AUTHORITY

Tangible Fixed Assets Scheduled

- KCTA sold the E.D.P. facility, which had been installed for the operation of Pusan East Container Terminal Co. (P.E.C.T.), to P.E.C.T.

Intangible Fixed Assets Schedule

- KCTA constructed a dormitory for employees and donated it to KMPA, and KCTA amortizes the use right it over 20 years.
- KCTA will construct an internal container depot (I.C.D.) and an office building and donate them to KMPA.
- KCTA acquired the port facility right from KMPA at the beginning of the operation and it has amortized the right over 5 years.

- KCTA agreed to share the responsibility for repayment of borrowings from I.B.R.D. with KMPA which initially borrowed them for Port Development.
- KCTA will complete the development for Kwangyang Port, Phase 1, and Pusan Port, Phase 4, and will donate them to KMPA.
- KCTA will enjoy the use right and will amortize it over 30 years.

Retained Earnings Schedule

- Law on the establishment of KCTA stipulates that KCTA contribute to Government, more than 10% of unappropriated earnings after disposition of deficit, if any.

Rental Revenue from Port Facility

- Based on the forecast cargo volume and projected changes in the average unit per ton.

- KCTA collects fixed revenue from Franchise Rent Agreement which calculates the rental revenue based on the number of berths.

Berthing Revenue

- KCTA will not levy berthing fee on the cargo to promote utilization of Kwangyang Pier.

KOREA MARITIME AND PORT ADMINISTRATION

PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Selected Documents Available in the Project File

1. An Explanatory Meeting for the Scheme for Financing from Private Sectors for the Development of Container Terminals. Korea Container Terminal Authority.

2. Public Notice on the Scheme for Financing from private sector for the Development of Container Terminals, August 25, 1993. Korea Container Terminal Authority.

3. The Large Marine Ecosystem (LME) Concept and its Application to Regional Marine Resource Management, October 1992. NOAA Technical Memorandum NMFS-F/NEC-91.

4. Distinct Characteristics of LMES.

5. Feasibility study for Ship Waste Disposal facilities, prepared by Korea Maritime Research Training Institute, May 1992.

6. Environmental assessment report for Pusan Phase IV Container Terminal, July 1991.

7. Environmental assessment report for the Dadaepo port and industrial complex, February 1994.

8. Environmental assessment report for the Port of Kwangyang Bay.

9. Development of Dadaepo Port Resettlement & Compensation Program, December 1993.

10. A Two Container Port Development Strategy.

11. Private Sector Participation in Container Handling.

12. Port Management and Performance Agreements.

KOREA

PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Table 1: PRELIMINARY COST ESTIMATES - DADAEPO

	(Won billion)	(US$million)[1]
(i) Navigation channel, dredging	7.42	9.00
(ii) Breakwater	106.08	133.00
(iii) Wharf, revetment	94.64	118.00
(iv) Reclamation	62.88	78.00
(v) Other shore works	32.52	41.00
(vi) Compensation, resettlement	28.46	36.00
(vii) Consultancy for design, supervision	8.20	10.00
Total	340.20	425.00

[1] Exchange rate: US$ = W800

KOREA

PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Table 2: DETAILED COST ESTIMATES - PUSAN PHASE IV

	(Won billion)	(US$million)[1]
I. Civil Works		
(a) Port Facilities		
(i) Dredging (KMPA)	16.70	20.90
(ii) Sea wall and quays	79.90	100.00
(iii) Stacking yards	105.30	131.40
(iv) Buildings, utilities	31.40	39.20
(v) Detailed engineering	2.00	2.50
Sub-total	235.30	294.00
(b) Approach Roads and Railways		
(i) Uam elevated road (3.5km)	51.20	64.00
(ii) Railways (double track: 3.9km)	22.10	28.00
(iii) Elevated road crossing (500m)	7.20	9.00
Sub-total	80.50	101.00
II. Equipment	59.00	73.70
Total	374.80	468.70[2]

[1] Exchange rate: US$ = W800

[2] KCTA bears all costs except for a portion of the costs for dredging and construction of the sea wall amounting to US$34.75 million which is borne by KMPA.

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PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Table 3: PRELIMINARY COST ESTIMATES - VESSEL TRAFFIC MANAGEMENT SYSTEM

	(Won billion)	(US$million)[1]
I. Civil Works		
(a) Inchon	4.20	5.25
(b) Pusan	2.60	3.25
Sub-total	6.80	8.50
II. Equipment		
(a) Inchon		
(i) radar station	1.80	2.25
(ii) VTS center	2.60	3.25
(iii) relay system	0.40	0.50
(iv) subsidiary equipment	0.72	0.90
(v) miscellaneous items	0.70	0.87
Sub-total	6.22	7.77
(b) Pusan		
(i) radar station	1.40	1.75
(ii) VTS center	1.60	2.00
(iii) relay system	0.20	0.25
(iv) subsidiary equipment	0.40	0.50
(v) miscellaneous items	0.31	0.38
Sub-total	3.91	4.88
Total	16.93	21.15

[1] Exchange rate: US$ = W800

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Table 4: PRELIMINARY COST ESTIMATES - SHIP WASTE DISPOSAL FACILITIES

	(Won billion)	(US$million)[1]
I. Civil Works	3.0	3.75
II. Equipment		
(i) tanks	0.66	0.83
(ii) trucks	0.25	0.31
(iii) floating barge	0.30	0.37
(iv) tanker	2.20	2.75
(v) machinery and pipe fittings	2.00	2.50
(vi) electrical equipment	0.70	0.88
(vii) engineering and construction materials	0.31	0.39
(viii) erection	0.47	0.58
Sub-total	6.89	8.61
Total	9.89	12.36

[1] Exchange rate: US$ = W800

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Table 5: SUMMARY OF TOTAL PROJECT COST AND FINANCING PLAN
(US$ million)

	Project Cost			Financial Plan			
	Local	Foreign	Total	Bank	KMPA/ MOST	KCTA	Others
1. Dadaepo							
(a) Civil Works							
(i) Breakwater							
Base Cost	86.45	46.55	133.00				
Physical Contingency	8.65	4.67	13.32				
Price Contingency	7.77	4.18	11.95				
Sub-Total	102.87	55.40	158.27	52.00	106.27	-	-
(ii) Other Works							
Base Cost	243.82	48.18	292.00				
Physical Contingency	24.81	4.81	29.19				
Price Contingency	21.92	4.33	26.25				
Sub-Total	290.12	57.32	347.44	-	10.64	-	336.80
(iii) Total							
Base Cost	330.27	94.73	425.00				
Physical Contingency	33.03	9.48	42.51				
Price Contingency	29.69	8.51	38.20				
Total	392.99	112.72	505.71	52.00	116.91	-	336.80
2. Pusan IV							
(a) Civil Works	..						
Base Cost	316.00	79.00	395.00				
Physical Contingency	31.61	7.89	39.50				
Price Contingency	28.40	7.10	35.50				
Sub-Total	376.01	93.99	470.00	-	41.24	428.76	-
b) Equipment							
Base Cost	7.37	66.33	73.70				
Physical Contingency	.74	6.64	7.38				
Price Contingency	.66	5.96	6.62				
Sub-Total	8.77	78.93	87.70	30.00	-	57.70	-
(c) Total							
Base Cost	323.37	145.33	468.70				
Physical Contingency	32.35	14.53	46.88				
Price Contingency	29.06	13.06	42.12				
Total	384.78	172.92	557.70	30.00	41.24	486.46	-
3. Vessel Traffic Management System							
(a) Civil Works							
Base Cost	6.80	1.70	8.50				
Physical Contingency	.69	.18	.87				
Price Contingency	.62	.14	.76				
Sub-Total	8.11	2.02	10.13	-	10.13	-	-
(b) Equipment							
Base Cost	1.27	11.38	12.65				
Physical Contingency	.13	1.14	1.27				
Price Contingency	.11	1.02	1.13				
Sub-Total	1.51	13.54	15.05	10.00	5.05	-	-
(c) Total							
Base Cost	8.07	13.08	21.15				
Physical Contingency	.82	1.32	2.14				
Price Contingency	.73	1.16	1.89				
Total	9.62	15.56	25.18	10.00	15.18	-	-

	Project Cost			Financial Plan			
	Local	Foreign	Total	Bank	KMPA/ MOST	KCTA	Others
4. Ship Waste Disposal Facilities							
(a) Civil Works							
Base Cost	3.00	.75	3.75				
Physical Contingency	.30	.08	.38				
Price Contingency	.26	.05	.31				
Sub-Total	3.56	.88	4.44	-	4.44	-	-
(b) Equipment							
Base Cost	.86	7.75	8.61				
Physical Contingency	.08	.78	.86				
Price Contingency	.08	.70	.78				
Sub-Total	1.02	9.23	10.25	5.50	4.75	-	-
(c) Total							
Base Cost	3.86	8.50	12.36				
Physical Contingency	.38	.86	1.24				
Price Contingency	.34	.75	1.09				
Total	4.58	10.11	14.69	5.50	9.19	-	-
5. Technical Assistance and Training							
(a) Yellow Sea LME							
Base Cost	.50	1.50	2.00				
Price Contingency	.05	.13	.18				
Sub-Total	.55	1.63	2.18	1.50	.68	-	-
(b) Feasibility/Detailed engineering for ship waste disposal facilities.							
Base Cost	.02	.38	.40				
Price Contingency	.00	.04	.04				
Sub-Total	.02	.42	.44	.40	.04	-	-
(c) Environmental Training							
Base Cost	.20	.40	.60				
Price Contingency	.01	.05	.06				
Sub-Total	.21	.45	.66	.40	.26	-	-
(d) Other Training							
Base Cost	.18	.20	.38				
Price Contingency	.01	.01	.02				
Sub-Total	.19	.21	.40	.20	.20	-	-
(e) Total							
Base Cost	.90	2.48	3.38				
Price Contingency	.07	.23	.30				
Total	.97	2.71	3.68	2.50	1.18	-	-
Grand-Total	792.94	314.02	1106.96	100	183.70	486.46	336.80

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PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Table 6: IMPLEMENTATION SCHEDULE

Project Tasks	Activity Start Date	Activity End Date	Duration of Activity (months)
1. Dadaepo			
(a) Dredging			
(i) Detailed design	Dec. 93	Dec. 94	12
(ii) Prepare bid documents	Jan. 95	Apr. 95	4
(iii) Bidding, evaluation, award contract	May 95	Nov. 95	6
(iv) Execute work	Dec. 95	Dec. 98	36
(b) Breakwater			
(i) Detailed design	Dec. 93	Dec. 94	12
(ii) Prepare bid documents	Jan. 95	May 95	5
(iii) Bidding, evaluation, award contract	June 95	Nov. 95	5
(iv) Construct	Dec. 95	Dec. 98	36
2. Ship Waste Disposal Facilities			
(i) Final feasibility study	May 94	Dec. 94	7
(ii) Detailed engineering	Jan. 95	July 95	7
(iii) Prepare bid documents	Aug. 95	Dec. 95	4
(iv) Bidding, evaluation, award contract	Jan. 96	May 96	5
(v) Construct	July 96	July 98	24
3. Vessel Traffic Management Systems			
(a) Inchon			
(i) Final feasibility and design	Apr. 94	Dec. 94	9
(ii) Prepare bid documents	Jan. 95	Apr. 95	4
(iii) Bidding evaluation, award contract	May 95	Oct. 95	6
(iv) Supply, install	Nov. 95	Oct. 96	12
(b) Pusan			
(i) Final feasibility and design	Mar. 95	Dec. 95	9
(ii) Prepare bid documents	Jan. 96	Apr. 96	4
(iii) Bidding evaluation, award contract	May 96	Oct. 96	6
(iv) Supply install	Nov. 96	Oct. 97	12

Project Tasks	Activity Start Date	Activity End Date	Duration of Activity (months)
4. Procurement of Container Quay Cranes			
(i) Prepare bid documents	June 94	Dec. 94	6
(ii) Bidding evaluation, award contract	Jan. 95	June 95	6
(iii) Manufacture, install	Jul. 95	Dec. 97	30
5. Yellow Sea Large Marine Eco-System Study			
(i) Finalize monitoring program	May 94	July 94	3
(ii) Procure sensors, instruments, etc.	Aug. 94	Oct. 94	3
(iii) Supplement program	Nov. 94	May 97	30
6. Environmental Training	June 95	June 99	48

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Table 7: PROCUREMENT PACKAGING

	Estimated Contract Value [1] ($ million)
A. Civil Works: (Dadaepo)	
1. Breakwater	133.0
B. Equipment	
1. Quayside container cranes	40.0
2. Waste Disposal Systems: plant, equipment, tanks and pipelines	8.6
3. Vessel Traffic Management System (radar, computers, etc.)	12.6
C. Technical Assistance/Studies	
1. Yellow Sea LME	2.0[2]
2. Detailed feasibility and engineering study for ship waste disposal facilities.	0.4
3. Training	0.6

[1] Base cost

[2] Includes consultant services and equipment procured by KORDI on a reimbursable basis.

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Table 8: CUMULATIVE DISBURSEMENTS SCHEDULE

BRD Fiscal Year & Quarter	Estimated Disbursements ($ million)		Cumulative disbursement profile for transport projects in Korea
	Quarter	Cumulative	%
1994			
06/30/94	-	-	-
1995			
09/30/94	-	-	-
12/31/94	4	4	-
03/31/95	-	4	-
06/30/95	2	6	6
1996			
09/30/95	4	10	-
12/31/95	8	18	18
03/31/96	8	26	-
06/30/96	8	34	34
1997			
09/30/96	10	44	-
12/31/96	10	54	54
03/31/97	8	62	-
06/30/97	8	70	70
1998			
09/30/97	4	74	-
12/31/97	4	78	78
03/31/98	4	82	-
06/30/98	4	86	86
1999			
09/30/98	4	90	-
12/31/98	4	94	94
03/31/998	1	95	-
06/30/99	1	96	96
2000			
09/30/99	-	96	-
12/31/99	2	98	98
03/31/00	-	98	-
06/30/00	2	100	100

• Assumes loan effectiveness by 09/30/94.

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Table 9: HISTORICAL TRAFFIC VOLUMES IN PUSAN PORT
('000 Tons)

Items	Grains		Crude Oil and Products		Cement		Coal		Timber		Iron Core		Others		Total	
Year	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
1979	1,651	3	3,540	20	1,459	197	1,077	-	2,782	618	-	-	7,852	8,854	18,271	9,692
1980	1,455	-	2,769	89	912	209	1,296	-	1,766	353	-	-	6,398	10,453	14,596	11,104
1981	1,547	-	2,692	100	867	193	1,786	-	1,725	367	-	-	7,906	12,534	16,523	13,194
1982	1,501	-	2,613	37	875	61	1,435	-	1,593	217	-	-	8,294	12,486	16,311	12,801
1983	1,804	-	2,636	42	1,376	72	1,179	-	1,441	105	-	-	9,067	13,785	17,503	14,004
1984	1,715	2	2,977	123	1,579	9	1,398	-	1,388	68	-	-	10,518	15,906	19,575	16,108
1985	1,795	-	4,147	179	1,431	10	1,600	-	1,418	38	-	-	10,979	16,812	20,370	17,039
1986	1910	6	3,390	306	1,316	19	1,386	-	1,468	14	-	-	12,852	22,491	22,370	22,836
1987	1,698	10	3,883	388	1,434	107	1,164	-	1,592	34	-	-	16,206	27,556	22,322	28,095
1988	1,749	4	4,134	208	1,873	-	1,112	-	1,697	3	-	-	17,969	30,515	25,977	30,809
1989	1,331	6	5,237	205	1,627	38	1,018	-	1,754	6	-	-	19,321	29,720	28,534	29,975
1990	1,454	7	5,578	109	2,051	58	842	-	2,015	-	-	-	21,173	24,271	30,288	24,445
1991	1,162	13	5,726	52	2,325	57	606	-	1,190	-	-	-	25,365	28,081	33,113	28,203
1992	1,120	97	6,683	338	2,202	55	657	6	1,819	267	3	3	21,761	29,803	36,373	30,569

Source: KMPA, Statistics Yearbook of Maritime and Ports 1993

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Table 10: PAST AND FUTURE TIMBER TRAFFIC BY PLACE OF ORIGIN
(1,000m³)

Total	1986	1987	1988	1989	1990	1991	1992	1996	2001	2006	2011
Total Tropical	**5,772**	**6,462**	**7,319**	**7,800**	**8,294**	**9,180**	**8,118**	**10,190**	**12,300**	**12,601**	**12,910**
Sub-Total Tropical	3,147	3,343	3,577	3,539	3,486	3,930	3,209	3,404	3,607	3,824	4,173
Philippines	24	-	10	-	4	-	-	-	-	-	-
Malaysia	2,193	2,338	2,755	2,811	3,011	3,362	2,285	2,422	2,569	2921	2,970
Papua New Guines	834	866	713	659	388	487	937	781	828	898	958
Solomon Islands	-	-	-	-	-	11	6	9	9	9	9
Sub-Total Pine	**96**	**139**	**99**	**69**	**83**	**70**	**181**	**192**	**203**	**216**	**236**
U S A	2,328	2,715	3,340	3,972	4,549	4,884	4,478	6,330	8,209	8,264	8,193
New Zealand	1,771	2,369	2,730	3,084	2,812	2,681	1,932	2,600	3,202	3,055	2,868
Chille	101	114	400	724	1,182	1,778	1,992	2,615	3,496	3,622	3,687
Others	456	232	210	164	555	425	754	1,115	1,511	1,587	1,638
	297	404	402	289	258	336	431	456	484	513	544

Source: KM Statistics 1993

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PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Table 11: PAST AND FORECAST FISH TRAFFIC
(Unit: 1000 Revenue Ton)

	1980	1988	1989	1990	1991	1992	1996	2001	2006	2011
Import Total	**405**	**799**	**1007**	**945**	**892**	**578**	**1,118**	**1,287**	**1,484**	**1,683**
Containerized	-	39	149	197	122	81	168	209	260	337
Non-containerized	405	740	858	748	790	497	950	1,078	1,224	1,346
Export Total	**71**	**297**	**339**	**256**	**280**	**100**	**314**	**358**	**403**	**448**
Containerized	67	288	325	249	266	95	298	340	383	426
Non-containerized	4	9	14	7	14	5	16	18	20	22
Total	**476**	**1074**	**1,346**	**1,201**	**1,192**	**678**	**1,432**	**1,645**	**1887**	**2,131**
Grand Total										
Containerized	67	325	474	446	388	176	466	549	643	763
Non-containerized	409	749	872	755	784	502	966	1,096	1,244	1,368

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Table 12: CONTAINER TRAFFIC IN PUSAN PORT

ARRIVAL									
	20'		35'		40'		Subtotal		TEU
Year	Total	Cargo (ton)	Total	Cargo (ton)	Total	Cargo (ton)	Total	Cargo (ton)	Total
1985	185,741	2,557,429	1,160	28,649	147,685	3,867,217	334,586	6,450,295	483,142
1986	232,958	2,557,429	894	22,296	198,028	4,642,994	431,880	7,831,642	630,578
1987	298,656	3,166,352	14	425	257,731	5,151,414	556,401	10,139,894	814,143
1988	338,490	4,988,055	0	0	273,545	6,366,579	612,035	12,239,025	885,580
1989	361,660	5,872,446	0	0	284,648	6,951,878	646,308	13,100,098	930,956
1990	372,885	6,148,220	0	0	304,106	9,103,631	675,970	14,855,966	930,075
1991	428,010	5,752,275	0	0	321,977	10,156,156	749,987	16,650,481	1,071,96
1992	462,353	6,503,3	0	0	334,497	869,969,80	796,850	15,632,075	1,131,349
DEPARTURE									
1985	223,091	4,196,871	2,453	102,667	222,386	10,184,919	447,930	14,484,457	622,155
1986	285,431	5,598,159	1,354	53,890	264,923	14,175,602	551,708	198,827,65	817,647
1987	355,810	7,516,483	0	0	327,590	16,717,802	683,400	24,234,285	1,010,990
1988	417,028	8,737,185	0	525	381,427	18,859,985	798,456	27,597,170	1,179,882
1989	454,841	9,658,973	14	0	386,503	17,474,970	841,358	27,134,468	1,227,872
1990	500,498	12,038,850	0	0	396,238	15,509,350	806,736	27,548,200	1,292,974
1991	516,633	12,723,675	0	0	429,378	12,828,775	946,011	25,552,450	1,375,389
1992	588,514	14,712,850	0	0	439,606	11,901,366	1,026,120	26,614,216	1,463,926

Source: KMPA Statical Yearbooks, 1991, 1992.

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Table 13: FORECAST CONTAINER TRAFFIC
('000 TEUs)

	1996	2001	2006	2011
Nationwide Container Forecast				
Pusan	3,052	3,435	4,128	5,013
Kwangyang	957	2,277	3,566	5,344
Inchon	397	495	566	711
Others	209	277	330	711
Total	**4,615**	**6,484**	**8,590**	**11,461**
Pusan Container Forecast				
Export	1,557	1,726	1,962	2,243
Import	1,117	1,232	1,398	1,612
Sub-total	**2,674**	**2,958**	**3,360**	**3,855**
T/S	233	328	601	968
Coastal	145	149	167	190
Total	**3,052**	**3,435**	**4,128**	**5,013**
Kwangyang Container Forecast				
Export	433	1,086	1,527	2,147
Import	406	875	1,382	1,967
Sub-Total	**839**	**1,961**	**2,909**	**4,114**
T/S	73	217	513	1,028
Coastal	45	99	144	202
Total	**957**	**2,277**	**3,566**	**5,344**

Source: KM Statistics - 1993

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PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Table 14: COST BENEFIT EVALUATION OF INVESTMENTS IN PUSAN PHASE IV
(Won million)

NPV 132822.1 (Cost); 319925.1 (Benefit); 187103.0 (Net)
IRR 0.254286 (Net)
BC 2.408673 (Net)

Year	Cost	Benefit	Net
1990	30,050	0	-30,050
1991	30,050	0	-30,050
1992	30,050	0	-30,050
1993	30,040	0	-30,050
1994	30,050	0	-30,050
1995	30,050	0	-30,050
1996	3,606	90,869.05	87,263.05
1997	3,606	90,869.05	87,263.05
1998	3,606	90,869.05	87,263.05
1999	3,606	90,869.05	87,263.05
2000	3,606	90,879.05	87,263.05
2001	3,606	90,879.05	87,263.05
2002	3,606	90,879.05	87,263.05
2003	3,606	90,879.05	87,263.05
2004	3,606	90,879.05	87,263.05
2005	3,606	90,879.05	87,263.05
2006	3,606	90,879.05	87,263.05
2007	3,606	90,879.05	87,263.05
2008	3,606	90,879.05	87,263.05
2009	3,606	90,879.05	87,263.05
2010	3,606	90,879.05	87,263.05
2011	3,606	90,879.05	87,263.05
2012	3,606	90,879.05	87,263.05
2013	3,606	90,879.05	87,263.05
2014	3,606	90,879.05	87,263.05
2015	3,606	90,879.05	87,263.05
2016	3,606	90,879.05	87,263.06
2017	3,606	90,879.05	87,263.05
2018	3,606	90,879.05	87,263.05
2019	3,606	90,879.05	87,263.05
2020	3,606	90,879.05	87,263.05

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PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Table 15: COST BENEFIT EVALUATION OF INVESTMENTS IN DADAEPO
(won million)

NPV (12%) 402,201 (Cost); 781,643 (Benefit); 379,442 (Net)
IRR 0.1633 (Net)
B/C Ratio 1.94 (Net)

Year	PCC	POMC	TCC	EDNPC	SCR	ITCR	VEDOR	APOLLR	TIMER	ACCDR	RCONR	EIPR	LANDCR	TC	TB	NET	TC-PV	TB-PV	NET-PV
1995	62347	0	5692.8	21800	0	0	0	0	0	0	0	0	0	89840	0	-89840	89840	0	-89840
1996	62347	1247	5692.8	21800	0	0	0	0	0	0	0	0	0	91087	0	-91087	81328	0	-81328
1997	62347	2494	5692.8	21800	0	0	0	0	0	0	0	0	0	92334	0	-92334	73608	0	-73608
1998	62347	3741	5692.8	21800	11569	3352	8158	1307	420	86	113	81250	0	93581	106255	12674	66609	75630	9021
1999	62347	4988	5692.8	21800	12056	3509	8550	1368	440	90	118	81250	0	94828	107381	12553	60265	68243	7978
2000	0	6235	0	0	12563	3674	8961	1432	460	95	124	81250	704000	6235	812359	806324	3538	461068	457330
2001	0	6235	0	0	13116	3831	9408	1493	480	98	130	81250	0	6235	109806	103571	3159	55631	52472
2002	0	6235	0	0	13350	3903	9597	1521	489	100	132	0	0	6235	29092	22857	2820	13160	10339
2003	0	6235	0	0	13589	3976	9789	1549	498	102	135	0	0	6235	29638	23403	2518	11970	9452
2004	0	6235	0	0	13832	4051	9985	1578	507	104	137	0	0	6235	30194	23959	2248	10888	8640
2005	0	6235	0	0	14079	4127	10186	1608	516	106	140	0	0	6235	30762	24527	2007	9905	7897
2006	0	6235	0	0	14331	4205	10390	1638	526	108	142	0	0	6235	31340	25105	1792	9010	7217
2007	0	6235	0	0	14426	4234	10466	1649	530	19	143	0	0	6235	31467	25232	1600	8077	6476
2008	0	6235	0	0	14521	4263	10543	1661	534	110	144	0	0	6235	31776	25541	1429	7282	5853
2009	0	6235	0	0	14617	4293	10620	1672	537	110	145	0	0	6235	31994	25759	1276	6547	5271
2010	0	6235	0	0	14713	4322	10698	1693	541	111	146	0	0	6235	32224	25989	1139	5887	4748
2011	0	6235	0	0	14810	4352	10777	1695	545	112	147	0	0	6235	32438	26203	1017	5291	4274
2012	0	6235	0	0	14810	4352	10777	1695	545	112	147	0	0	6235	32438	26203	908	4724	3816
2013	0	6235	0	0	14810	4352	10777	1695	545	112	147	0	0	6235	32438	26203	811	4218	3407
2014	0	6235	0	0	14810	4352	10777	1695	545	112	147	0	0	6235	32438	26203	724	3766	3042
2015	0	6235	0	0	14810	4352	10777	1695	545	112	147	0	0	6235	32438	26203	646	3363	2716
2016	0	6235	0	0	14810	4352	10777	1695	545	112	147	0	0	6235	32438	26203	577	3002	2425
2017	0	6235	0	0	14810	4352	10777	1695	545	112	147	0	0	6235	32438	26203	515	2681	2166
2018	0	6235	0	0	14810	4352	10777	1695	545	112	147	0	0	6235	32438	26203	460	2394	1933
2019	0	6235	0	0	14810	4352	10777	1695	545	112	147	0	0	6235	32438	26203	411	2137	1726
2020	0	6235	0	0	14810	4352	10777	1695	545	112	147	0	0	6235	32438	26203	367	1908	1541
2021	0	4988	0	0	14810	4352	10777	1695	545	112	147	0	0	4988	32438	27450	262	1704	1442
2022	0	3741	0	0	14810	4352	10777	1695	545	112	147	0	0	3741	32438	28697	175	1521	1346
2023	0	2494	0	0	14810	4352	10777	1695	545	112	147	0	0	2494	32438	29944	104	1358	1254
2024	0	1247	0	0	3241	1000	2619	388	125	26	34	0	0	1247	7433	6186	47	278	231

PCC: Port const. cost
POMC: Port operating and maintenance cost
TCC: Terminal construction cost
ENDPC: Env. (den. land value) deterioration by processing complex
SCR: Ship cost reduction (ship waiting)
ITCR: Inland transport cost reduction

VEDOR: Stevedore cost red. (handling)
APOLLR: Air pollution cost reduction
ACCDR: Traffic accident damage reduction
RCONR: Road const./supply cost reduction (road damage)
EIPR: Environmental improvement by processing plant removal
LANDCR: Land creation value

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PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Table 16: PROJECT COST-BENEFIT ANALYSIS
(won million)

	PHASE IV			DAEDAPO			
Year	Total Cost	Total Benefit	Net Benefit	Total Cost	Total Benefit	Net Benefit	Total Project Net Benefit
1990	30,050		-30,050			0	-30,050
1991	30,050		-30,050			0	-30,050
1992	30,050		-30,050			0	-30,050
1993	30,050		-30,050			0	-30,050
1994	30,050		-30,050				-30,050
1995	30,050		-30,050	89,840	0	-89,840	-119,890
1996	3,606	90,869.05	87,263.051	91,087	0	-91,087	3,823.9
1997	3,606	90,869.05	87,263.05	93,334	0	-92,334	5,070.9
1998	3,606	90,869.05	87,263.05	93,581	106,255	12,674	99,937.1
1999	3,606	90,869.05	87,263.05	94,828	107,381	12,553	99,816.1
2000	3,606	90,869.05	87,263.05	6,235	812,559	806,324	893,586.1
2001	3,606	90,869.05	87,263.051	6,235	109,806	103,571	190,834.1
2002	3,606	90,869.05	87,263.05	6,235	29,092	22,857	110,120.1
2003	3,606	90 869.05	87,263.05	6,235	29,638	23,403	110,666.1
2004	3,606	90,869.05	87,263.05	6,235	30,194	23,959	111,222.1
2005	3,606	90,869.05	87,263.05	6,235	30,762	24,527	111,790.1
2006	3,606	90,869.05	87,263.05	6,235	31,340	25,105	112,368.1
2007	3,606	90,869.05	87,263.05	6,235	31,467	25,232	112,495.1
2008	3,606	90,869.05	87,263.05	6,235	31,776	25,541	112,368.1
2008	3,606	90,869.05	87,263.05	6,235	31,994	25,759	112,804.1
2009	3,606	90,869.05	87,263.05	6,235	32,224	25,989	113,022.1
2010	3,606	90,869.05	87,263.05	6,235	32,438	26,203	113,252.1
2011	3,606	90,869.05	87,263.05	6,235	32,438	26,203	113,466.1
2012	3,606	90,869.05	87,263.05	6,235	32,438	26,203	113,466.1
2013	3,606	90,869.05	87,263.05	6,235	32,438	26,203	113,466.1
2014	3,606	90,869.05	87,263.05	6,235	32,438	26,203	113,466.1
2015	3,606	90,869.05	87,263.05	6,235	32,438	26,203	113,466.1
2016	3,606	90,869.05	87,263.05	6,235	32,438	26,203	113,466.1
2017	3,606	90,869.05	87,263.05	6,235	32,438	26,203	113,466.1
2018	3,606	90,869.05	87,263.05	6,235	32,438	26,203	113,466.1
2019	3,606	90,869.05	87,263.05	6,235	32,438	26,203	113,466.1
2020	3,606	90,869.05	87,263.05	6,235	32,438	26,203	113,466.1
2021				4,988	32,438	27,450	27,450
2022				3,741	32,438	28,697	28,647
2023				2,494	32,438	29,944	29,944
2024				1,247	7,433	6,186	6,186
2025						3,784	6,186
2026						3,847	3,847
ERR			25.44%	36.33%			33.32%

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KOREA MARITIME AND PORT ADMINISTRATION

PORT DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Actual and Forecast Income Statements
For the Twelve Months Ended December 31

(Won million)

	ACTUAL						FORECAST					
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
OPERATING REVENUES												
REVENUE FROM PORT FAC	97,122	107,356	120,909	124,983	159,607	182,491	212,991	247,891	288,291	335,925	382,535	437,867
RENTALS	35,309	28,828	15,071	13,505	24,109	24,109	24,109	24,109	24,109	24,109	24,109	26,761
TOTAL OPER. REVENUES	132,431	136,184	135,980	138,488	183,716	206,600	237,100	272,000	312,400	360,034	406,644	464,628
OPERATING EXPENSES												
EMPLOYEE SERVICES	17,910	20,920	24,854	28,845	32,337	36,253	39,545	43,136	47,052	51,325	55,985	61,068
MAINTENANCE & ADMIN. EXP.	16,460	15,548	21,799	33,466	34,805	36,197	37,645	39,150	40,717	42,345	44,039	45,801
REPAIRS	5,915	5,574	8,525	8,601	10,744	12,137	13,473	15,728	18,991	22,177	25,287	28,450
DEPRECIATION	27,247	35,821	36,270	40,851	52,552	59,366	65,900	76,929	92,892	108,473	123,687	139,156
TOTAL OPER. EXPENSES	67,532	77,863	91,448	111,763	130,438	143,953	156,562	174,943	199,652	224,319	248,998	274,474
OPERATING INCOME	64,899	58,321	44,532	26,725	53,278	62,647	80,538	97,057	112,747	135,715	157,646	190,154
NON-OPER INCOME (NOTE 1)	11,174	9,697	13,842	18,026	13,102	13,102	13,102	13,102	13,102	13,102	13,102	13,102
NON-OPERATING EXPENSES												
INTEREST (NET)	11,882	11,975	12,647	13,363	12,234	10,661	9,409	8,799	8,401	7,900	7,310	6,328
OTHER (NOTE 2)	2,574	32,655	20,855	34,965	8,172	9,013	9,847	11,110	12,843	14,566	16,284	18,054
TOTAL NON-OPER EXPENSES	14,456	44,630	33,502	48,328	20,406	19,674	19,256	19,909	21,244	22,466	23,594	24,382
EXTRAORDINARY LOSS (NOTE 3)	5,782	782	1,769	1,044	0	0	0	0	0	0	0	0
NET INCOME	55,835	22,606	23,103	(4,621)	45,974	56,075	74,383	90,250	104,605	126,351	147,154	178,874

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KOREA MARITIME AND PORT ADMINISTRATION

PORT DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Actual and Forecast Balance Sheets

As of December 31

(Won million)

	ACTUAL						FORECAST					
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
ASSETS												
CURRENT ASSETS												
CASH & SECURITIES	2,939	2,587	4	20	1,167	(326)	428	11,787	30,917	68,370	97,670	122,995
ACCOUNTS RECEIVABLES	3,021	1,832	2,284	2,733	2,756	3,099	3,556	4,080	4,686	5,401	6,100	6,969
INVENTORIES	1,603	3,017	2,154	2,408	3,731	4,117	4,478	5,004	5,710	6,416	7,122	7,850
OTHER	5,890	540	315	290	315	315	315	315	315	315	315	315
TOTAL CURRENT ASSETS	13,453	7,976	4,757	5,451	7,969	7,205	8,778	21,186	41,628	80,502	111,207	138,129
GROSS FIXED ASSETS IN OPER.	1,403,933	2,676,496	3,007,588	3,270,250	3,771,036	4,183,222	4,646,500	5,661,053	6,785,297	7,748,659	8,823,791	9,821,275
LESS ACCUM. DEPRECIATION	(124,258)	(46,647)	(84,000)	(127,992)	(185,308)	(250,055)	(321,929)	(405,832)	(507,145)	(625,451)	(760,350)	(912,120)
NET FIXED ASSETS IN OPER.	1,279,675	2,629,849	2,923,588	3,142,258	3,585,728	3,933,166	4,324,571	5,255,221	6,278,152	7,123,208	8,063,441	8,909,155
CONSTRUCTION IN PROGRESS	374,621	374,062	410,923	524,632	868,780	1,330,263	1,568,222	1,507,663	1,468,820	1,618,494	1,770,519	1,779,121
OTHER ASSETS	347	355	360	361	361	361	361	361	361	361	361	361
TOTAL ASSETS	1,668,096	3,012,242	3,339,628	3,672,702	4,462,838	5,270,995	5,901,932	6,784,430	7,788,961	8,822,565	9,945,528	10,826,766
LIABILITIES & EQUITY												
CURRENT LIABILITIES												
ACCOUNTS PAYABLE & OTHER	4,799	10,682	12,156	2,634	17,768	25,859	30,089	29,159	28,609	31,326	34,088	34,374
CUR PORTION OF L/T DEBT	16,672	22,684	23,239	23,239	23,239	21,596	21,596	17,336	18,056	14,963	16,063	14,957
TOTAL CURRENT LIABILITIES	21,471	33,366	35,395	25,873	41,006	47,455	51,685	46,495	46,665	46,288	50,150	49,331
LONG TERM DEBT (NET)	122,264	149,478	164,624	156,659	133,421	115,024	100,628	102,493	93,237	91,074	79,012	64,055
UNEARNED	0	0	0	0	0	59,437	119,281	411,817	643,479	853,465	1,128,763	1,131,365
EQUITY												
CAPITAL STOCK	447,881	447,881	447,881	447,881	447,881	447,881	447,881	447,881	447,881	447,881	447,881	447,881
REVALUATION SURPLUS	183,269	1,353,509	1,353,509	1,353,509	1,614,380	1,721,952	1,839,947	1,969,684	2,127,340	2,315,685	2,529,381	2,771,284
SUBSIDY BY GOVERNMENT	286,862	358,870	500,618	748,614	1,230,145	1,817,677	2,197,516	2,564,001	3,077,252	3,582,649	4,071,975	4,540,297
CAPITAL CONTRIBUTION	331,233	380,001	524,147	641,922	651,787	661,276	670,317	677,133	683,574	689,639	695,328	700,641
RETAINED EARNINGS	275,116	289,137	313,454	298,244	344,218	400,293	474,677	564,927	669,532	795,883	943,038	1,121,911
TOTAL EQUITY	1,524,361	2,829,398	3,139,609	3,490,170	4,288,411	5,049,078	5,630,337	6,223,626	7,005,580	7,831,737	8,687,602	9,582,015
TOTAL LIAB & EQUITY	1,668,096	3,012,242	3,339,628	3,672,702	4,462,838	5,270,995	5,901,932	6,784,430	7,788,961	8,822,565	9,945,528	10,826,766

KOREA

KOREA MARITIME AND PORT ADMINISTRATION

PORT DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Actual and Forecast Source and Application of Funds Statements

For the Twelve Months Ended December 31

(Won million)

	ACTUAL					FORECAST					
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
SOURCES OF FUNDS											
BUSINESS OPERATION											
NET INCOME	22,606	23,103	(4,621)	45,974	56,075	74,383	90,250	104,605	126,351	147,154	178,874
DEPRECIATION	39,084	39,764	44,310	57,316	64,747	71,874	83,903	101,313	118,306	134,899	151,770
F.X LOSS	20,232	5,527	15,274	0	0	0	0	0	0	0	0
AMORT OF UNEARNED INCOME	0	0			0	(3,962)	(8,216)	(28,266)	(45,595)	(62,634)	(85,162)
NET INC OF CURR.POR.OF L/T DEBT	(6,012)	(555)	0	0	1,643	0	4,260	(720)	3,093	(1,100)	1,106
LOSS(GAIN) ON DISPOS OF FIX.ASSET			1,044								
CASH GENERATION FROM BUSINESS OPER.	75,910	67,839	56,007	103,290	122,465	142,295	170,198	176,932	202,155	218,320	246,587
DISPOSAL OF FIXED ASSET & OTHER	70,224	20,058	293	0	0	0	0	0	0	0	0
BORROWINGS											
IBRD	31,304	10,779	0	0	3,200	7,200	19,200	8,800	12,800	4,000	0
OTHER LOANS	1,804	24,862	0	0	0	0	0	0	0	0	0
TOTAL BORROWINGS	33,108	35,641	0	0	3,200	7,200	19,200	8,800	12,800	4,000	0
SUBSIDY BY GOVERNMENT.(NET)	72,008	141,748	247,996	481,531	587,531	379,839	366,485	513,252	505,397	489,325	468,323
CASH FROM KCTA FOR DEBT SERVICE			10,801	9,865	9,489	9,041	6,816	6,441	6,065	5,689	5,313
TOTAL SOURCES	251,250	265,286	315,097	594,686	722,686	538,375	562,698	705,424	726,417	717,334	720,223
APPLICATIONS OF FUNDS											
CAPITAL PROJECTS	239,915	245,177	281,477	584,063	706,660	519,436	523,504	667,817	669,110	675,529	676,419
INCREASE IN OTHER ASSETS	8	5	1	0	0	0	0	0	0	0	0
REPAYMENT OF DEBT	20,114	25,467	23,239	23,239	23,239	21,596	21,596	17,336	18,056	14,963	16,063
DECREASE IN RETAINED EARNINGS	8,585	(115)	164	0	0	0	0	0	0	0	0
CHANGE IN WORKING CAPITAL EXCL. CASH	(17,020)	(2,665)	10,200	(13,763)	(5,720)	(3,412)	6,240	1,142	1,798	(2,457)	2,417
TOTAL APPLICATIONS	251,602	267,869	315,081	593,539	724,179	537,620	551,340	686,294	688,963	688,034	694,899
NET CASH FLOW	(352)	(2,583)	16	1,147	(1,493)	755	11,358	19,130	37,454	29,300	25,325

KOREA

KOREA MARITIME AND PORT ADMINISTRATION

PORT DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Key Financial Ratios Schedule

As of and for the Twelve Months Ended December 31

	ACTUAL						FORECAST					
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
WORKING RATIO	30.42%	30.87%	40.58%	51.20%	42.39%	40.94%	38.24%	36.03%	34.17%	32.18%	30.82%	29.12%
OPERATING RATIO	50.99%	57.17%	67.25%	80.70%	71.00%	69.68%	66.03%	64.32%	63.91%	62.30%	61.23%	59.07%
NET INCOME/OPG REVENUE	42.16%	16.60%	16.99%	-3.34%	25.02%	27.14%	31.37%	33.18%	33.48%	35.09%	36.19%	38.50%
RATE RETURN ON NET FIXED AS OP INCOME(NET FA IN OP BEG+END)*2	5.21%	2.98%	1.60%	0.88%	1.58%	1.67%	1.95%	2.03%	1.96%	2.03%	2.08%	2.24%
RETURN ON EQUITY NET INCOME/TOTAL EQUITY	3.66%	0.80%	0.74%	-0.13%	1.07%	1.11%	1.32%	1.45%	1.49%	1.61%	1.69%	1.87%
RETURN ON BORROWED FUNDS NET INCOME(TOT LIAB+EQUITY)	3.35%	0.75%	0.69%	-0.13%	1.03%	1.08%	1.29%	1.42%	1.46%	1.59%	1.67%	1.84%
ACID TEST RATIO (CASH & SEC+A/R)/TOT CUR LIAB	0.28	0.13	0.06	0.11	0.10	0.06	0.08	0.34	0.76	1.59	2.07	2.63
CURRENT RATIO TOTAL CUR ASSET/TOT CUR LIAB	0.63	0.24	0.13	0.21	0.19	0.15	0.17	0.46	0.89	1.74	2.22	2.80
LONG TERM DEBT/EQUITY LT DEBT(NET)/TOTAL EQUITY	0.08	0.05	0.05	0.04	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01
DEBT SERVICE COVERAGE (NET INCOME + DEPR+NET INT)/ (NET INT+REPAYMENT OF LOAN)	1.85	2.19	1.89	1.35	3.12	3.72	4.83	5.79	8.00	9.35	12.49	14.49
SELF FINANCING RATIO (CASH FROM OPERATIONS+ BEG CASH BAL/CAPITAL SPENDING)	NA	32.87	28.72	19.90	17.69	17.50	27.33	32.59	28.26	34.83	42.44	50.89

Table 20

KOREA

KOREA CONTAINER TERMINAL AUTHORITY

PORT DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Actual and Forecast Income Statements

For the Twelve Months Ended December 31

(Won million)

	ACTUAL						FORECAST				
	(9 MON)1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
OPERATING REVENUES											
RENTAL REV FROM PORT FAC	13,122	33,015	34,601	36,800	41,673	46,353	48,670	57,104	78,293	79,781	79,781
BERTHING REVENUE	0	3,040	3,106	3,600	4,033	4,524	4,750	4,987	6,257	7,341	8,126
TOTAL OPER. REVENUES	13,122	36,055	37,707	40,400	45,706	50,876	53,420	62,091	84,550	87,122	87,907
OPERATING EXPENSES											
SALARY EXPENSES	1,178	2,565	2,930	3,165	3,418	3,691	3,986	4,305	4,650	5,022	5,424
SEV & RET BENEFITS	0	519	519	270	591	623	415	499	629	690	777
DEPRECIATION EXPENSES	26	299	53	53	55	45	40	44	48	52	57
AMORT PORT FAC RIGHTS	7,261	14,523	14,523	14,523	14,523	7,261	0	5,440	14,257	14,257	14,257
OTHERS	754	1,372	1,884	1,972	2,185	3,021	3,314	3,659	4,066	4,547	5,116
TOTAL OPER. EXPENSES	9,219	19,278	19,909	19,983	20,772	14,642	7,756	13,947	23,650	24,568	25,631
OPERATING INCOME	3,903	16,777	17,798	20,417	24,934	36,234	45,665	48,144	60,901	62,554	62,277
NON-OPERATING INCOME (NOTE 1)	415	3,144	6,398	490	352	278	631	1,193	2,218	3,520	4,248
NON-OPERATING EXPENSES (NOTE 2)	753	5,004	3,311	138	2,050	7,617	18,606	32,300	70,093	49,482	43,644
SPECIAL GAINS	0	0	309	0	0	0	0	0	0	0	0
NET INCOME BEFORE INCOME TAX	3,565	14,917	21,194	20,770	23,237	28,894	27,690	17,037	(6,974)	16,593	22,880
INCOME TAX	1,154	4,752	4,248	3,285	3,397	3,918	2,409	2,275	0	5,884	9,095
NET INCOME	2,411	10,165	16,946	17,484	19,839	24,976	25,281	14,762	(6,974)	10,708	13,786

KOREA

KOREA CONTAINER TERMINAL AUTHORITY

PORT DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Actual and Forecast Balance Sheets

As of December 31

(Won million)

	ACTUAL						FORECAST				
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
ASSETS											
CASH & SECURITIES	16,141	40,385	26,115	5,193	19,477	36,642	69,386	127,784	185,100	192,519	175,067
ACCOUNTS RECEIVABLE	3,765	7,014	7,356	7,676	8,684	9,667	10,158	11,797	16,065	16,553	16,702
OTHER	265	450	2,342	870	870	870	870	870	870	870	870
TOTAL CURRENT ASSETS	20,171	47,769	35,813	13,739	29,031	47,178	80,406	140,451	202,035	209,942	192,640
EQUITY SEC OF AFFIL CO	450	450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450
LONG TERM LOANS	133	256	355	383	420	469	531	608	704	822	965
DEPOSIT FOR SEWER & RET	0	260	465	645	940	1,252	1,459	1,709	2,023	2,368	2,757
LEASE DEPOSIT SUBS RIGHT	289	242	298	300	16	18	20	22	24	26	28
TOTAL INVEST.& OTHER ASSETS	872	1,208	2,568	2,778	2,826	3,189	3,460	3,789	4,201	4,666	5,200
GROSS TANG FIX ASSET(EXC CIP)	264	2,860	510	521	541	563	587	613	642	674	709
LESS ACCUM. DEPRECIATION	(26)	(325)	(129)	(182)	(237)	(282)	(322)	(366)	(413)	(465)	(523)
NET TANG FIX ASSETS(EXC CIP)	238	2,535	381	339	304	280	264	247	229	208	186
CONSTRUCTION IN PROGRESS	205	2,465	34,414	90,748	141,400	236,200	197,200	0	0	0	0
BLDG & ICD USE RIGHTS	0	0	647	614	19,921	18,922	17,922	16,923	15,923	14,923	13,924
PORT FACILITY USE RIGHTS	65,353	50,830	36,307	21,784	7,261	0	163,200	422,260	408,003	393,747	379,490
TOTAL FIXED ASSETS	65,796	55,830	71,749	113,477	168,887	255,402	378,587	439,430	424,155	408,878	393,600
TOTAL ASSETS	86,839	104,806	110,130	129,994	200,743	305,769	462,452	583,670	630,391	623,486	591,440

KOREA

KOREA CONTAINER TERMINAL AUTHORITY

PORT DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Actual and Forecast Balance Sheets (cont)

As of December 31

(Won million)

	ACTUAL						FORECAST				
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
LIABILITIES & EQUITY											
ACCOUNTS PAYABLE & OTHER	1,812	4,571	1,273	1,674	1,731	1,992	1,238	1,172	36	2,979	4,585
ACCRUED INTEREST PAYABLE	0	0	0	0	1,500	7,590	21,545	46,838	110,648	105,758	95,103
SHORT TERM DEBT	0	0	0	0	0	0	27,600	11,900	0	0	0
CURRENT PORTION OF L/T DEBT	7,672	9,903	9,865	9,489	9,041	6,816	6,441	6,232	16,356	37,187	44,667
TOTAL CURRENT LIABILITIES	9,484	14,474	11,138	11,164	12,272	16,398	56,825	66,142	127,040	145,924	144,355
BONDS	10,002	18,276	18,276	26,550	76,550	136,550	206,550	286,550	286,550	256,548	218,274
L/T BORROWING FROM GOV	0	0	0	5,000	15,000	35,000	55,000	69,833	69,167	67,500	64,500
L/T BORROWING FROM IBRD O'D	64,942	59,202	51,364	41,875	32,833	26,017	19,576	13,511	7,821	2,508	(0)
L/T BORROWING NEW	0	0	0	0	0	4,100	13,600	24,000	24,000	23,795	22,910
SEV & RETIRE.BENEFITS	0	519	1,020	1,290	1,881	2,504	2,919	3,418	4,047	4,737	5,514
TOTAL L/T LIABILITIES	86,428	92,471	81,798	85,878	138,537	220,569	354,470	463,454	518,625	501,012	455,553
RES FOR EQUIP REPLACE	0	2,170	11,318	26,631	42,367	60,223	82,701	105,454	118,740	118,740	122,101
RETAINED EARNINGS											
BAL AFTER ADJUST	0	0	68	0	0	0	0	0	0	(6,974)	0
NET INCOME	2,411	10,165	16,946	17,484	19,839	24,976	25,281	14,762	(6,974)	10,708	13,786
TOTAL EQUITY	2,411	12,335	28,332	44,115	62,207	85,199	107,982	120,216	111,766	122,474	135,887
TOTAL LIAB & EQUITY	86,839	104,806	110,130	129,994	200,743	305,769	462,452	583,670	630,391	623,486	591,440

KOREA

KOREA CONTAINER TERMINAL AUTHORITY

PORT DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Actual and Forecast Source and Application of Cash Statements

For the Twelve Months Ended December 31

(Won million)

	ACTUAL				FORECAST						
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
SOURCES OF FUNDS											
NET INCOME	2,411	10,165	16,946	17,484	19,839	24,976	25,281	14,762	(6,974)	10,708	13,786
DEPRECIATION EXP.	26	299	53	53	55	45	40	44	48	52	57
AMORT OF INTANGIBLE FIX ASSET	7,261	14,523	14,526	14,555	14,555	8,261	1,000	6,440	15,256	15,256	15,256
TRANS OF CIP TO ADV PAYMENT	0	0	163	0	0	0	0	0	0	0	0
TRANS OF CIP TO OPE EXP	0	0	197	0	0	0	0	0	0	0	0
FX TRANSLATION LOSS	0	4,163	2,027	0	0	0	0	0	0	0	0
PRO FOR SEV & RET BENEFIT-GENERAL	0	519	519	270	591	623	415	499	629	690	777
NET INCREASE OF CURR POR OF L/T DEB	(7,672)	(2,231)	38	376	448	2,225	375	209	(10,124)	(20,831)	(7,480)
LOSS(GAIN FROM)ON DISP OF FIX ASSET	0	0	(249)	0	0	0	0	0	0	0	0
CASH GENERATION FROM BUS OPER	2,026	27,439	34,222	32,736	35,489	36,131	27,110	21,953	(1,166)	5,876	22,396
DEC IN LONG TERM LOANS	0	5	30	36	36	42	47	53	61	70	82
DEC IN LEASE DEPOSIT + OTHER	0	55	2,459	0	266	0	0	0	0	0	0
ISSUANCE OF BONDS	10,002	8,274	0	8,274	50,000	60,000	70,000	80,000	10,000	0	0
BORROWING FROM IBRD	0	0	0	0	0	4,100	9,500	10,400	0	0	0
BORROWING FROM GOVERNMENT	0	0	0	5,000	10,000	20,000	20,000	15,000	0	0	0
TOTAL SOURCES	12,028	35,772	39,711	46,048	95,813	120,273	126,657	127,406	8,895	5,946	22,478
APPLICATIONS OF FUNDS											
ACQUI OF EQUITY SEC OF AFFIL CO	450	0	1,000	0	0	0	0	0	0	0	0
INC IN LONG TERM LOANS	133	126	129	63	76	91	109	131	157	188	226
INC IN LEASE DEP &TT SUB RIGHT	299	8	56	2	2	2	2	2	2	2	2
INC IN DEP FOR SEV & RET	0	260	223	180	295	312	207	250	314	345	389
INC IN TANGI FIX ASSET(EXC CIP)	264	2,596	82	11	20	22	24	26	29	32	35
CAPITAL SPENDING IN PROJECTS	205	2,260	32,902	56,326	70,000	94,800	124,200	67,300	0	0	0
REPAYMENT OF BORROWINGS	0	7,672	9,903	9,865	9,469	9,041	8,816	8,441	8,232	16,356	37,187
PAYMENT OF SEV & RET BENEFITS	0	0	16	0	0	0	0	0	0	0	0
CONTRIBUTION TO GOVERNMENT	0	241	1,017	1,701	1,748	1,864	2,496	2,528	1,476	0	373
CHANGE IN NET WORKING CAP EXCL CAS	(5,454)	(1,556)	5,570	(1,178)	(100)	(3,144)	(39,943)	(7,670)	(56,630)	(16,396)	1,718
TOTAL APPLICATIONS	(4,113)	11,609	50,900	66,970	81,529	103,108	93,913	99,008	(46,421)	(1,473)	39,930
NET CASH FLOW	16,141	24,163	(14,189)	(20,922)	14,284	17,165	32,744	58,398	57,316	7,419	(17,452)

KOREA

KOREA CONTAINER TERMINAL AUTHORITY

PORT DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

Key Financial Ratios Schedule

As of and for the Twelve Months Ended December 31

	ACTUAL					FORECAST					
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
WORKING RATIO	14.72%	10.92%	12.75%	12.63%	12.19%	11.23%	11.80%	11.22%	9.13%	9.84%	10.85%
OPERATING RATIO	70.26%	53.47%	52.80%	49.46%	45.45%	28.78%	14.52%	22.46%	27.97%	28.20%	29.16%
NET INCOME/OPS REVENUE	18.37%	28.19%	44.94%	43.28%	43.41%	49.09%	47.32%	23.77%	-8.25%	12.29%	15.68%
RATE OF RETURN ON FIX ASS(EX CIP) OPER INCOME/(FA EX CIP BEG+END)*2	5.95%	28.21%	39.25%	67.98%	99.29%	155.22%	45.53%	15.51%	14.10%	15.02%	15.52%
RETURN ON EQUITY NET INCOME/TOTAL EQUITY	100.00%	82.41%	59.81%	39.63%	31.89%	29.32%	23.41%	12.28%	-6.24%	8.74%	10.14%
RETURN ON BORROWED FUNDS +EQUITY NET INCOME/(TOTAL LIAB+EQUITY)	2.78%	9.70%	15.39%	13.45%	9.88%	8.17%	5.47%	2.53%	-1.11%	1.72%	2.33%
ACID TEST RATIO (CASH & SEC+A/R)/TOTAL CUR LIAB	2.10	3.27	3.01	1.15	2.29	2.82	1.40	2.11	1.58	1.43	1.33
CURRENT RATIO TOTAL CUR ASSET/TOTAL CUR LIAB	2.13	3.30	3.22	1.23	2.37	2.88	1.41	2.12	1.59	1.44	1.33
LONG TERM DEBT/EQUITY LT DEBT(NET)/TOTAL EQUITY	35.02	7.50	2.89	1.95	2.23	2.59	3.28	3.86	4.64	4.09	3.35
DEBT SERVICE COVERAGE (NET INCOME + DEPR+NET INT)/ (NET INT +REPAYMENT OF LOAN)	NA	3.32	3.24	3.25	3.21	2.43	1.74	1.37	1.02	1.14	0.90
SELF FINANCING RATIO (ANNUAL CASH FROM OPERATIONS+BEG CASH BAL/CAPITAL SPENDING)	NA	1928.28	226.51	104.49	58.12	58.66	51.33	135.72	--	--	--

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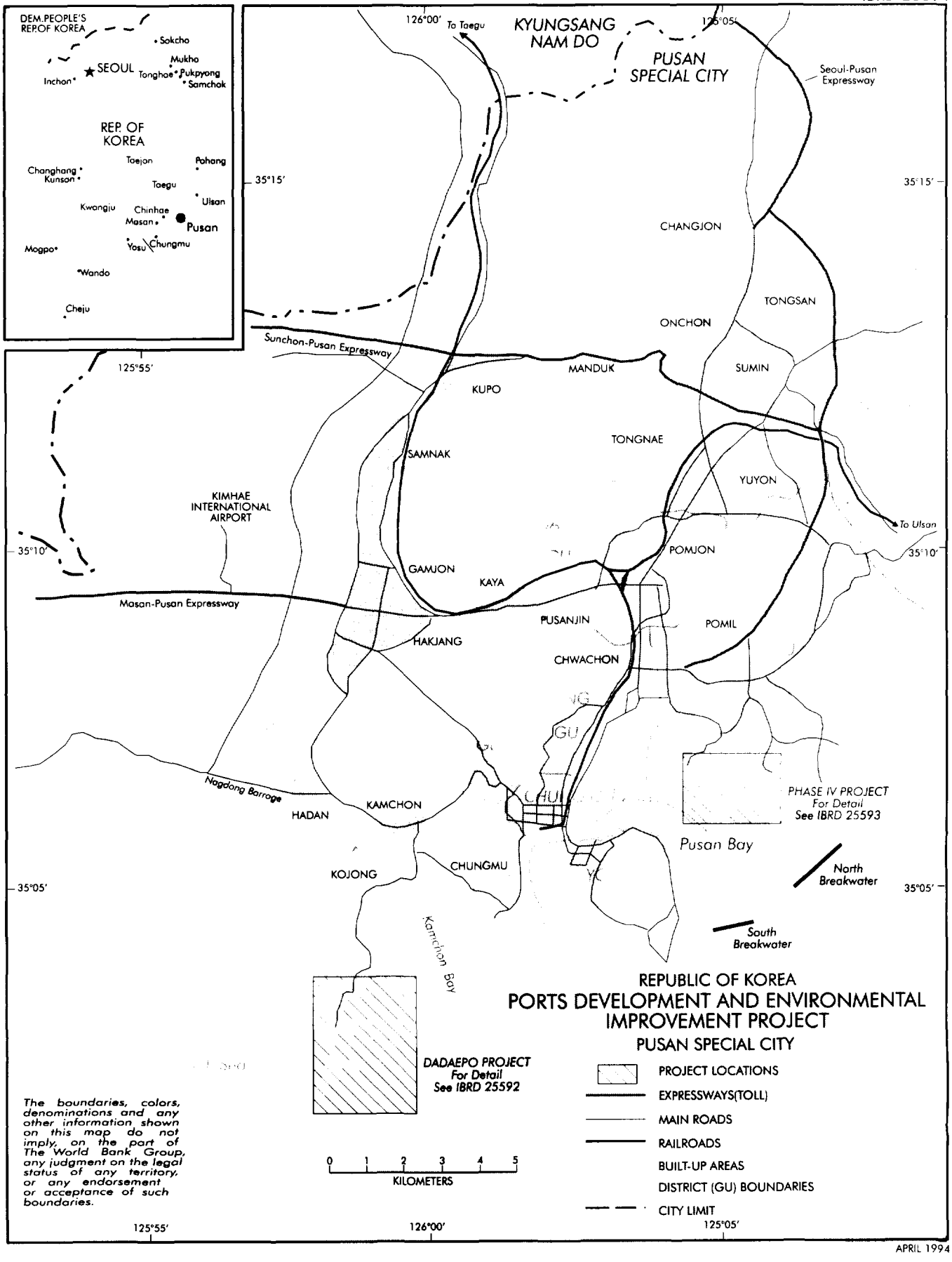


REPUBLIC OF KOREA
PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT
PUSAN SPECIAL CITY

PROJECT LOCATIONS
EXPRESSWAYS(TOLL)
MAIN ROADS
RAILROADS
BUILT-UP AREAS
DISTRICT (GU) BOUNDARIES
CITY LIMIT

The boundaries, colors, denominations and any other information shown on this map do not imply, on the part of The World Bank Group, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries.

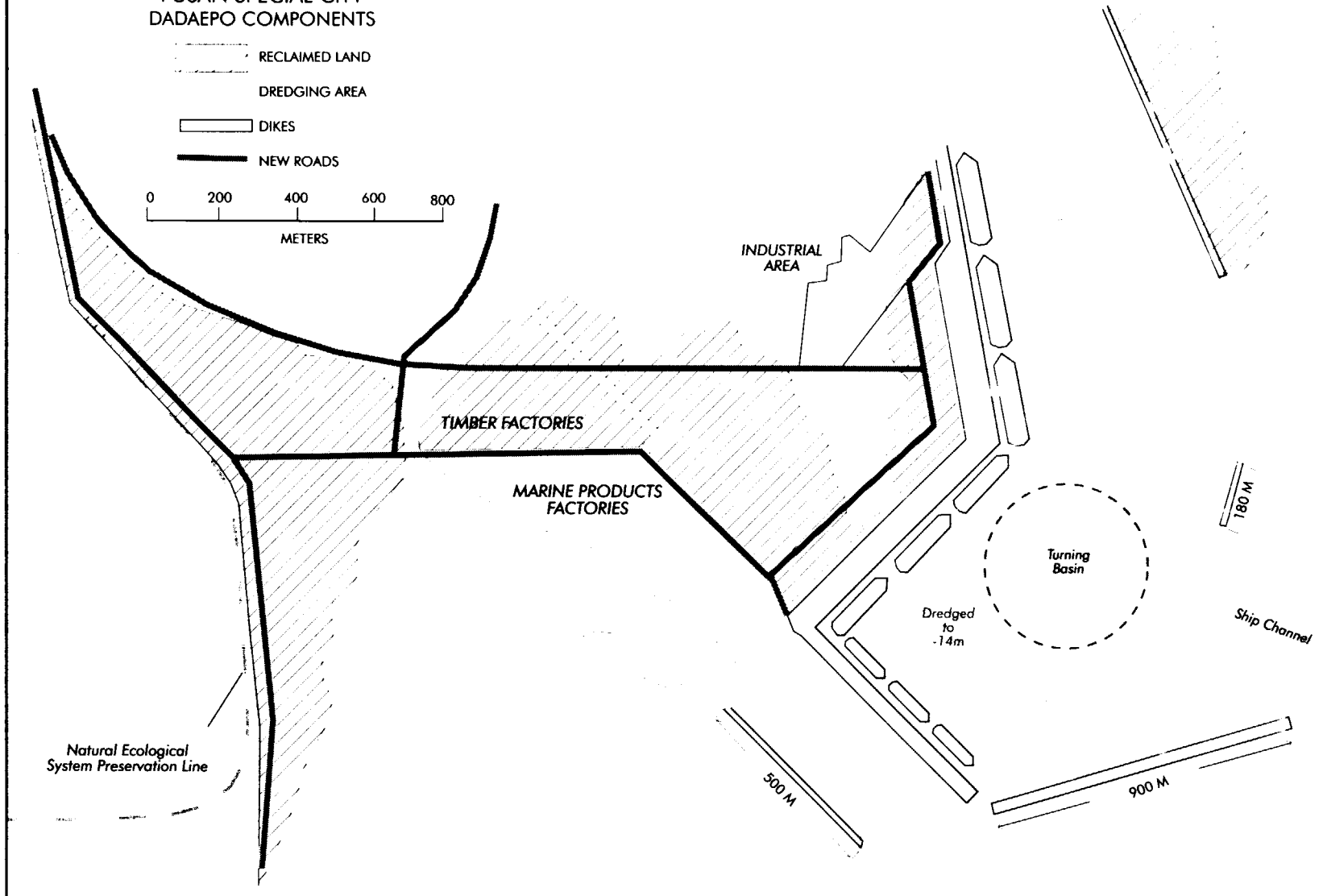
APRIL 1994

REPUBLIC OF KOREA

PORTS DEVELOPMENT AND ENVIRONMENTAL IMPROVEMENT PROJECT

PUSAN SPECIAL CITY

DADAEPO COMPONENTS



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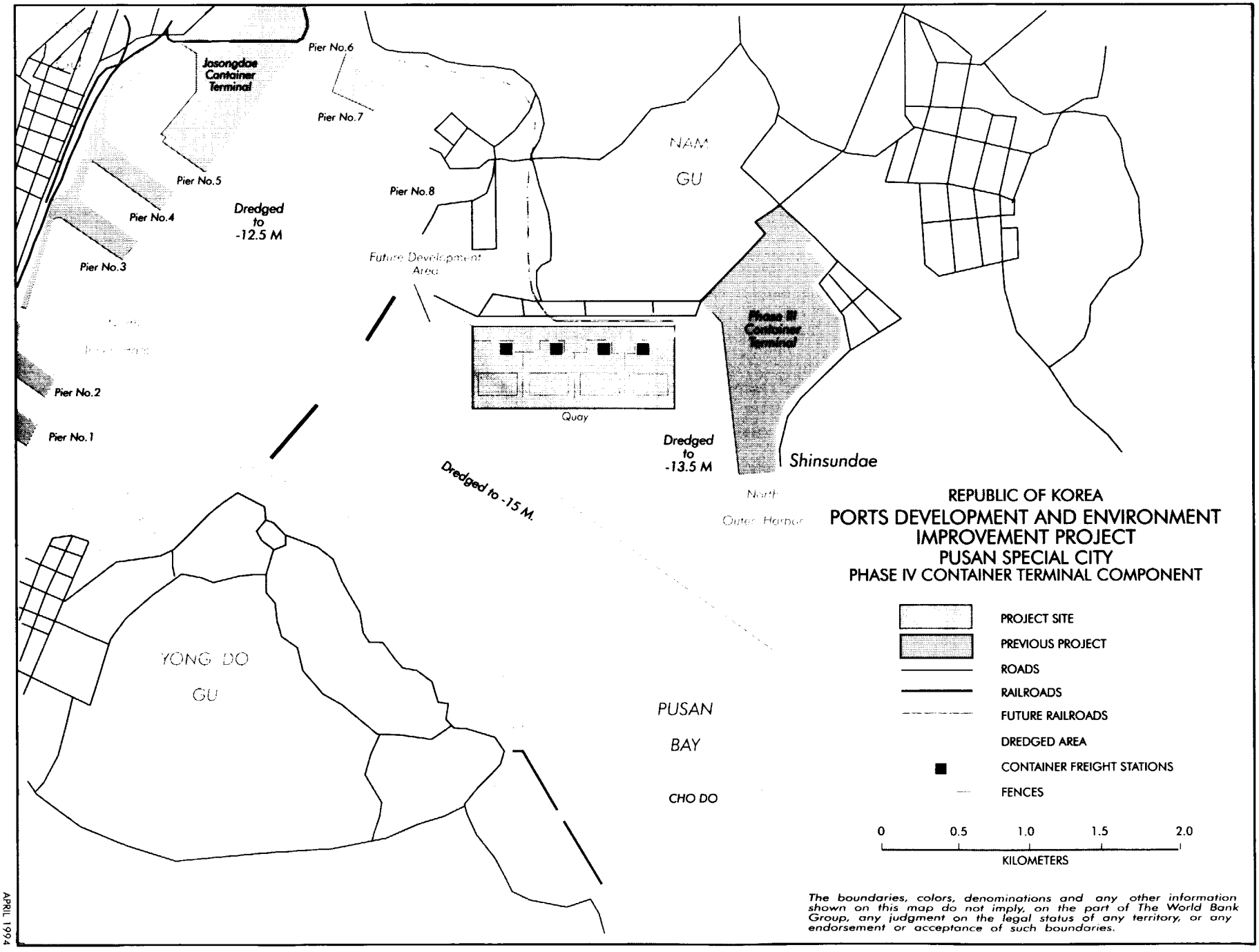

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